For CONTENTS, see pages iii and iv of Cover.

pp. 537–618.] [April 15, 1913.

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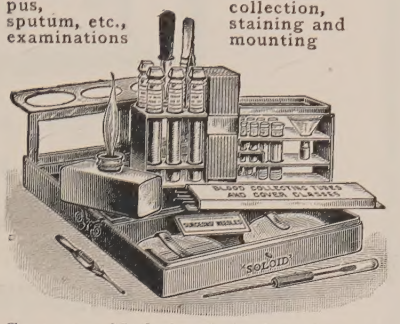

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PLAGUE.

Seventh Report on Plague Investigations in India issued by the Advisory Committee appointed by the Secretary of State for India, the Royal Society, and the Lister Institute.—*Jl. of Hygiene, Plague Supplement* 2. 1912. [Issued Jan., 1913.] Reports xlviii. to lxiii. pp. 207-402.

xlviii. **Plague in Madras City.** pp. 207-220. With 1 chart.

Though Madras is the third largest city in India, and has a population of more than half a million souls, plague has never been prevalent with the exception of a limited outbreak in 1905-1906. The risk of importation by sea is lessened by the fact that ships discharge their cargo into small boats, and are unable to come alongside the wharfs. The city however is brought into the closest communication with plague-infected districts by its railways. The climatic conditions between November and February are not unfavourable to the spread of the disease. 1,220,686 rodents have been destroyed in the city since 1906, of which approximately 50 per cent. were *Mus rattus*, 22 per cent. mice, 24 per cent. bandicoots, and 3 per cent. musk-rats. The absence of *M. decumanus* is noteworthy. The Madras *M. rattus* is exceptionally susceptible to plague; a dose of an emulsion of a plague rat's spleen which kills 20 to 40 per cent. of *M. rattus* from Bombay, Poona, or Belgaum, destroys 95 to 100 per cent. of Madras rats.

The immunity of Madras from plague cannot be explained by absence of rat-fleas, for an average of 4 *X. cheopis* were counted on 11,897 *M. rattus*, but this figure is lower than those of plague centres; for instance it is 9 in Poona and 19 in Belgaum.

The energetic measures taken by the Sanitary Administration appear to be the chief cause of Madras' freedom from plague.

xlix. **Statistics of the Occurrence of Plague in Man and Rats in Bombay, 1907-1911.** pp. 221-226.

During the period 1907-1911, 24,756 deaths from plague occurred in Bombay; 563,784 rats were examined, among which 14,991 *M. rattus* and 60,614 *M. decumanus* were found to be infected.

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The phenomena observed in Bombay in 1905-1906 have been repeated year by year. The epizootic first appears among the *M. decumanus*, then invades *M. rattus*, and shortly afterwards man is attacked.

M. decumanus suffers rather more than twice as severely from acute plague as does *M. rattus*. The probable explanation is that the average number of fleas found on *M. decumanus* in Bombay is rather more than twice that found on *M. rattus*.

l. **The Distribution of White-bellied *Mus rattus* in Bombay Island.** pp. 227-228. With 1 map.

Eight per thousand of 315,557 Bombay rats were the white-bellied form of *M. rattus* known as *M. alexandrinus*.

In the most densely populated quarters their ratio was only 1 per thousand, but in the least populous areas it rose to 26 per thousand.

li. **The Immunity of the Wild Rat in India.** pp. 229-265. With 1 map.

Twenty-three series of experiments were undertaken in which groups of rats from various towns and cities, usually 100 in each, were inoculated with one-hundredth to one-fifth of a milligram of a plague-rat's spleen. Altogether 9,843 rats received such a dose as represented from 12,000 to 200,000 plague bacilli. The resistance of the rats varied with the local prevalence of plague: thus no less than 97 per cent. of 1,390 rats obtained from plague-free Madras died of the infection, but only 38 per cent. of 1,387 Bombay rats, and 33 per cent. of 1,355 Poona rats succumbed. Both the latter cities have suffered severely from plague annually. The places investigated fall into three groups.

(1) Places which have suffered severely and almost continuously from plague for ten years or more.

Only 10 per cent. of the rats of Belgaum, where the incidence of plague has been very heavy, died. No more than 18 per cent. of 414 Cawnpore rats succumbed. The mortality of 349 Lucknow rats was 34 per cent. In six other plague spots the percentage ranged from 37 to 42. Nagpur alone of the places in this group gave susceptible rats, 97 per cent. of which died of the inoculation.

(2) Places in which the incidence of plague has been small.

The susceptibility of the Madras City rats was mentioned above. Raipur (Central Provinces) and the following five towns in the Madras Presidency have had little plague and give susceptible rats, Vaniyambadi, Calicut, Palghat, Podanur, and Coimbatore, though they were rather more resistant in the last-named place where plague had prevailed extensively during the three years before the investigation.

(3) Places which have been free from plague.

Rats from the plague free localities Banda (United Provinces), Madura (Madras), Dacca (Assam) were as little immune as those from Madras City.

The immunity of resistant rats depends largely on the dose of bacilli inoculated. It is difficult to convey plague by the bite

of one flea, and only 2 per cent. of Poona rats and 6 per cent. of Bombay rats died of plague when they were subjected to the attacks of many infected fleas. 24 and 31 per cent. succumbed to an inoculation of 1/100 mgm. of plague-rat spleen, 26 and 42 per cent. to 1/20 mgm., but when the dose was increased to 1/5 mgm. 77 per cent of Poona rats and 78 per cent. of Bombay rats died.

It is probable that the resistance is due not merely to the immunisation of the rats during a previous plague epizootic, but to selective influences by which the more susceptible rodents are destroyed in an epizootic. Young rats reproduce the resistance of their parents with remarkable fidelity.

Bandicoots are as susceptible to plague as Madras rats. Mice were relatively immune whether they were captured in a plague infected area or not.

Summary—

"1. Rats from different places show varying degrees of immunity to plague.

"2. This immunity is relative to the infecting dose.

"3. Immunity is greatest in places which have suffered most severely from plague, less marked in those places which have suffered to a moderate extent and least in those places in which epidemic plague has not occurred.

"4. This immunity is not always acquired from an attack of plague, and is transmitted by the parents to their offspring which have not been exposed to infection."

lii. **Chronic or Resolving Plague.** pp. 266-286. With 1 chart and 1 plate.

The lesions of resolving plague are, chronic buboes, necrotic areas in the spleen, chronic abscesses in the spleen and liver.

Resolved or post-plague lesions are adhesions of the spleen to the surrounding structures, scars in the spleen, bisected or trisected spleen, fibrous thickening of its capsule, perisplenitis.

27,699 *M. decumanus* caught in Bombay were examined, 0·57 per cent. of which showed signs of resolving plague, and 1·47 per cent. resolved plague.

Of 27,889 *M. rattus* 0·15 per cent. bore evidence of resolving plague and 0·77 per cent. resolved plague.

Chronic buboes, mostly cervical, were found in 42 per cent. of resolving lesions of *M. decumanus*, abscesses of spleen in 24 per cent., necrotic areas in spleen in 34 per cent.

Adhesions were present in 55 per cent. of the resolved lesions of *M. decumanus*, scars in 17 per cent., bisected spleen in 17 per cent., and perisplenitis in 11 per cent. The respective ratios for *M. rattus* were nearly the same.

Resolving plague was found in 0·4 per cent. of 148,287 *M. rattus* trapped in Poona. Resolved plague in 0·46 per cent.

Lesions similar to those of resolving and resolved plague, although the *B. pestis* was absent, were found in 0·23 per cent. of 15,523 rats caught in Madras City which has been free from plague since 1905.

The pus of buboes in 78 rats was examined; cultures were sterile in 27; pure growths of *B. pestis* were obtained in seven, although the pus had failed to infect guinea-pigs: the contents

of the buboes of seven induced plague when injected subcutaneously into these animals—the cutaneous method of inoculation often fails to infect when the *B. pestis* are few in number. In 18 per cent. of these cases organisms which resembled *B. pestis* were seen microscopically, but cultural and animal experiments were negative.

Fifteen per cent. of the necrotic areas in the spleen of 74 rats contained *B. pestis* fatal to guinea-pigs; in 3 per cent. this bacillus was isolated by culture, although the animal test failed; in 4 per cent. rods resembling *B. pestis* were seen in smears; and in 32 per cent. the cultures were sterile.

The pus of 15 out of 36 abscesses of the spleen or liver infected guinea-pigs; in 2, cultures of *B. pestis* were obtained when the inoculation test was negative; in 5, plague-like rods were found microscopically.

A chart is given in which are traced the curves of acute plague, resolving, and resolved plague by months; both the latter are at their maximum during, or immediately after, the highest point of the acute plague tracing, and fall nearly to zero a year later. Therefore it is probable that the life of a wild rat does not greatly exceed a year.

Conclusions.—

"1. Lesions, for which we propose the terms resolving and resolved plague lesions, are found in rats which have been subjected to plague infection and in certain individuals are stages in the natural process of recovery from the acute form of this disease.

"2. These lesions are very different from the lesions found in the acute stages of the disease. They are generally localised and confined for the most part to the spleen.

"3. It is not always possible to prove that these lesions are due to the plague bacillus by isolating that bacillus from them, for in many cases the bacilli have been killed, have disappeared or been replaced by some other organism.

"4. That the lesions are frequently produced by the plague bacillus has been shown by (a) demonstrating the presence of plague bacilli in some of these lesions which exactly resemble others, either in the same rat or other rats, in which no plague bacilli can be found, (b) by showing that the lesions increase in numbers during and after epizootics of the disease.

"5. Nevertheless the fact must be borne in mind that very similar lesions can be produced by other causes, as has been shown by our experience of the examination of rats in Madras city, where the disease is not present."

liii. **The Experimental Production of Resolving Plague and Post-Plague Lesions in Rats.** pp. 287-291.

1,079 rats which had survived inoculation with the plague bacillus were killed three weeks later; 11 per cent. showed resolving or resolved plague lesions. The largest proportion of changes occurred in the survivors of the most susceptible rats; thus all except 18 of 1,000 Madras rats died after inoculation, and 9 of the 18 survivors bore signs of having passed through an attack of plague. The converse holds true, for resolving plague lesions were present in 5 only of 160 Poona rats which survived inoculation out of 300 tested.

Ninety-one per cent. of the rats which contracted a fatal infection died in the first week; 7·5 per cent. in the second week; and 1·5 per cent. in the third week.

liv. **Experimental Plague Epidemics among Rats** (Fourth Communication). pp. 292-299.

Five to 15 inoculated and 15 uninoculated rats were put into each of six rat-houses, from three of which fleas were excluded. In eight experiments 46 per cent. of the 360 uninoculated rats in the flea-infested houses were infected and died, but only one of the 360 uninoculated rats in the control rat-houses succumbed, and in this instance 4 fleas had gained access. These experiments confirm those already published on the spread of plague from infected rats to their healthy companions through the agency of fleas.

In most of the tests the proportion of rats which contracted the disease varied with the number of fleas present. The degree of septicaemia in the infecting rat was a marked factor, for when the number of *B. pestis* in the blood of the inoculated rats was small, the fleas transmitted plague to 33 per cent. of 105 healthy rats, when the number was high the ratio rose to 63 per cent. of 150 rats. The bubo was cervical in 88 per cent. of 167 rats thus infected.

Conclusion.—

"As regards the mortality in the different epizootics it appears therefore that the flea prevalence and the degree of septicaemia developing in the infected rats were the chief influences at work."

lv. **Observations on Flea Breeding in Poona.** pp. 300-325. With 7 charts.

Egg Laying.—*X. cheopis* caught on the bodies of recently killed *M. rattus* were transferred to test-tubes by means of a platinum loop, five to each tube. When kept in the dark, the female fleas lay the largest proportion of their eggs during the first hour of their incarceration; they were therefore retained in the tubes for this period, and the eggs were then counted. The results of several thousand experiments show that within certain limits of temperature, the number of ova deposited varies with the humidity; for example, in August 1911, when the average humidity was 85·5 per cent. of saturation, 130 fleas laid 314 eggs, which equals 2·4 eggs per flea. In April 1910 when the humidity was 30·3 per cent. only, 127 fleas deposited an average of 0·6 egg per flea.

95 fleas kept in tubes for one hour at a temperature from 70°-84° F. in an atmosphere, the humidity of which was 44-65 per cent., laid on an average, 1·5 eggs each. When the cotton wool plug was moistened with water, 45 fleas gave an average of 2·4 eggs per flea.

Fleas were placed in tubes the air of which had been dried with calcium chloride, and were kept for one hour at temperatures of 13°-20° C.; 24°-28° C.; and 35°-39° C. The temperature 24°-28° C. was most favourable for egg-laying, 1·8 eggs per flea; 13°-20° C. next, with 0·07 egg per flea; and the high temperature was least favourable, with 0·03 per flea; 45 fleas were used in each series.

Egg Hatching.—32·6 per cent. of 5,543 ova exposed to diffused sunlight hatched, and 32·9 per cent. of 5,571 eggs kept in the dark.

In August 1910, 32·6 per cent. of 731 eggs hatched when the humidity was 86·8 per cent. but the percentage was 3·4 in 178 eggs when the humidity was 44 per cent. of saturation.

In the cooler months of the year the period of incubation is prolonged; for example in December 1910, when the temperature was 67° F., 43 per cent. of the eggs hatched, but not until 7-12 days after laying. On the other hand, in May 1910, when the temperature was 85° F., the larvae appeared on the 5th and 6th days, though only 11 per cent. of the eggs were fertile.

Raising the humidity is favourable to the hatching of eggs during the dry months. Drying the air is inimical: 148 eggs were kept in calcium chloride tubes, but they were all sterile.

The seasonal variations in egg laying and hatching run together; more than twenty times as many larvae were obtained in September and October when it was warm and wet, as in April and May when it was hot and dry.

Development of the Larvae.—The greatest proportion of fleas was obtained from larvae in June—9 from 40; nearly the same ratio in July—19 from 94; but in August only 16 out of 133 larvae reached maturity, and 8 of 167 in September: none attained the adult stage in the remaining months of the year.

40 fleas developed from 614 larvae kept under natural conditions, and the larvae remained active on an average of 19 days. 46 fleas developed from 568 larvae confined in an atmosphere saturated with water, and 26 days was the average period of activity of the larvae.

Length of Life of a Flea.—Fleas deprived of food lived longest in August; the average life of 55 fleas was 4·6 days, when the humidity was high, namely 85 per cent. of saturation. When the saturation was reduced to 45 per cent. in April and May, 55 fleas survived for an average of 0·74 day only.

The addition of moisture prolongs the life of fleas, especially in the hot and dry months. The mean duration of life of 140 fleas kept without food under normal conditions was 3 days, but when the air was saturated with moisture 120 fleas lived for an average of 4·8 days each. When the air was dried the mean duration of life of 90 fleas was 1·3 days.

Groups of 65 fleas were kept at temperatures of 98°-104° F.; 55°-85° F.; and 55°-65° F. deprived of food. The mean duration of life of the first group was 0·14 day; of the second 1·17 day; and of the third 1·66 days.

64 newly hatched fleas lived without food 7·2 days each on an average. 2·6 days was the mean duration of life of 545 fully grown fleas under similar conditions.

These experiments show that fleas conveyed in luggage or merchandise may be the means of transmitting plague over considerable distances.

The results of artificial breeding harmonise with observations on the prevalence of fleas in nature. The onset of wet weather in June marks an increase in egg laying and hatching which causes the abundance of adult fleas which is noticed in July.

Summary.—

"1. The laying of eggs by wild fleas, the development of the eggs into larvae and the development of larvae into pupae and imagines all show a marked seasonal variation, being most active when the weather is wet and the temperature moderate and least active under dry and hot conditions.

"2. Within the range of temperatures obtaining in Poona, atmospheric humidity seems to be a more important factor than temperature in conditioning this seasonal variation.

"3. Artificial humidification of the atmosphere is favourable to all stages of the metamorphosis especially in the dry season.

"4. The seasonal variations in the results of artificial breeding correspond in time to the seasonal variations in the prevalence of fleas on rats in nature.

"5. The life of an adult flea is longer in a cool and moist atmosphere than under hot and dry conditions."

A chart is given in which are shown the percentages of the number of eggs per 100 fleas above and below the mean by months; of the number of larvae per 100 eggs; of the number of larvae per 100 fleas; of the life of fleas in days; of the number of fleas on wild rats; and of the incidence of human plague. The curves roughly rise and fall together.

lvi. **The Serum Treatment of Human Plague.** pp. 326-339.

Yersin serum, prepared at the Lister Institute by the injection of dead and afterwards living bacilli, and an antitoxic serum resulting from the immunisation of horses with the nucleoprotein of the *B. pestis* were employed. Doses of 500 cc. and upward were given intravenously. Alternate cases were treated with serum, 222 in all, the mortality of which was 66·2 per cent. 73·9 per cent. of the 222 control cases died. All the patients whose blood contained more than 40 *B. pestis* per cc. died, whether treated by serum or not.

The antitoxic serum possessed no advantage over the Yersin serum.

Conclusion.—

"From the whole enquiry therefore it appears that the administration of the available sera is not a practicable means of bringing about any material diminution in the mortality from plague in India."

lvii. Rowland (Sydney). **Attempt to separate the Antigen from the Nucleoprotein of the Plague Bacillus by Filtration through Gelatin.** pp. 340-343.

The antigen of plague is associated with a nucleoprotein soluble in dilute salines. The protective value of the bacillus and of its nucleoprotein are the same. Hydrolysis affects the nucleoprotein but leaves the antigen intact; hence the two substances are not identical. Attempts to separate the antigen from the nucleoprotein by filtration through gelatin were unsuccessful.

lviii. Rowland (Sydney). **Besredka's Method of Vaccination.** pp. 344-349.

Besredka asserted that plague vaccine is deprived of its toxic properties by treatment with specific serum. Three vaccines were prepared: in one the dead bacilli were soaked in anti-plague serum; in the second normal horse serum was used instead of the specific; and in the third physiological salt solution took the place of the serum. The lethal dose of the three emulsions did not differ greatly when rats were inoculated.

The amount of endotoxine which could be extracted from plague bacilli before and after soaking in serum was determined by washing the respective suspensions, mixing with anhydrous sodium sulphate, powdering the solid mass, adding enough water to form a saturated solution of sodium sulphate, filtering, and extracting the residue with water. The nucleoprotein was estimated by weighing the precipitate obtained on boiling with acetic acid. The yield of nucleoprotein was nearly the same in every case, and experiments on rats showed that its toxicity was not lessened by the immune or normal horse serum.

Immune horse serum contains opsonin, and normal horse serum an amboceptor for the plague bacillus.

Besredka's statement that sensitised organisms yield an atoxic vaccine was not confirmed.

lix. Rowland (Sydney). **The Relation of Pseudo-Tubercle to Plague as evidenced by Vaccination Experiments.** pp. 350-357.

B. pseudo-tuberculosis rodentium resembles *B. pestis* in every respect except virulence to rats. It causes fatal infections in guinea-pigs, however, the post mortem appearances of which are similar to those arising from *B. pestis*. Moreover immunity to plague is conferred on guinea-pigs by vaccination with the pseudo-tubercule bacillus.

Broth cultures of pseudo-tubercle were killed with chloroform and were injected into 44 guinea-pigs. Their first dose amounted to about one quarter of an agar slope, the second was double this quantity; one month later their immunity was tested by inoculating them with 1/10 cc. of a broth culture of a virulent plague bacillus. All the 44 animals were protected; nine out of ten control guinea-pigs which received a similar dose, died of plague. It is not possible to immunise rats by this method, for all of 37 vaccinated rats died when inoculated with plague.

The nucleoprotein obtained from the pseudo-tubercle bacillus is harmless to guinea-pigs and rats in doses as large as 10mg., but it had no protective influence against plague on 26 rats and 26 guinea-pigs which had been vaccinated with 0·01mg. On the other hand the nucleoprotein of the plague bacillus is toxic for rats and has immunising powers, but it is harmless to guinea-pigs and confers no immunity. It may be stated generally that the efficiency of a vaccine is correlated with its toxicity.

Growing bacteria in the presence of their own products lowers their virulence. Conversely, to maintain the virulence of a micro-organism, the culture should be kept under such conditions

as will reduce the rate of growth to a minimum; subcultures on the most favourable medium are then incubated at a temperature at which the rate of growth will be greatest.

Ten rats were inoculated with virulent plague bacilli which had grown for two days in broth containing plague nucleoprotein, none of these died of acute plague, but four died after the fifth day. Of ten rats inoculated at the same time with the same culture grown in ordinary broth seven died of acute plague.

The nucleoprotein plague culture postponed the death of ten guinea-pigs into which it was inoculated, and the post-mortem appearances were changed from those of acute plague to those typical of pseudo-tubercle in its most usual form. Hence the plague bacillus which has been grown in nucleoprotein solution is indistinguishable from the pseudo-tubercle bacillus of rodents.

Summary.—

"1. The plague bacillus is equally virulent for guinea-pigs and rats, but whereas it is easy by either the whole bacillus or the contained nucleoprotein soluble in saline to immunise the rat against plague it is almost impossible to immunise the guinea-pig, either by means of the bacillus or its nucleoprotein.

"2. The pseudo-tubercle bacillus is almost without pathogenicity for rats whereas the guinea-pig is susceptible to it.

"3. It is easy to immunise the guinea-pig against plague by means of the pseudo-tubercle bacillus; very difficult to immunise the rat.

"4. It was not found possible to immunise either the rat or the guinea-pig against plague by means of the nucleoprotein contained in the pseudo-tubercle bacillus.

"5. Whereas the nucleoprotein of the plague bacillus grown on broth agar is toxic for rats it is hardly so at all for guinea-pigs. The nucleoprotein obtained from the pseudo-tubercle bacillus is relatively innocuous to either rats or guinea-pigs."

lx. Rowland (Sydney). **Observations on the Mechanism of Plague Immunity.** pp. 358-366.

When emulsions of plague bacilli are inoculated into the peritoneum of normal animals, the first effect is the exudation of mononuclear leucocytes, followed in the third hour by the appearance of polynuclears and active phagocytosis; flakes of fibrin form in which the bacilli are entangled, and these become attached to the great omentum which retracts on them. Death takes place before the blood stream is invaded by bacilli.

In the immune animal the number of plague bacilli at any stage is much smaller than at a corresponding period in the normal animal.

On subcutaneous inoculation it is found that the local reaction is much less in the immune rat than in the normal; the unvaccinated rat provides a good culture medium, the immune rat a bad one; hence it is probable that the essential factor in plague immunity is one which affects the multiplication of the bacillus.

In investigating the rates of multiplication of plague bacilli in normal and immune rats, the most satisfactory method of counting consists in the use of the 8 mm. apochromatic of Zeiss with his aplanatic condenser, both with central stops and a special counting chamber without lines. The dark ground effect is perfect.

Normal rat serum is bactericidal to *B. pestis*. Twenty million plague bacilli incubated at 37° C. in normal rat serum were reduced to half a million in 10 hours. If the serum had been deprived of its complement by heating at 55° C. for half an hour it proved a favourable medium and multiplication was rapid.

In parallel experiments with unheated rat serum in which increasing amounts of the endotoxine contained in the plague bacillus had been added to a series of tubes the preliminary lysis occurred, but the rate of multiplication of the survivors was accelerated by the endotoxine which induced chain formation. When the experiment was repeated with immune serum, a much larger amount of the endotoxine was required to bring about this result.

lxi. Rowland (Sydney). **The Onset and Duration of the Immunity consequent on the Inoculation of Plague Nucleoprotein.** pp. 367-372. With 2 charts.

The injection of nucleoprotein, either freshly prepared or after autolysing for two months, caused no protection to 80 rats inoculated with plague within 18 hours of its administration. The curve of immunity rapidly ascends after this interval, being at its highest point on the third day. The more toxic the vaccine, the greater is the immunity, and the earlier it is acquired; but after the fourth day the differences disappear and the curve remains at the same level for months. Three months after the injection of 0·1 mg. of nucleoprotein 19 rats survived the test inoculation; and 85 per cent. of 20 rats which had received 0·01 mg. were protected. At five months 60 per cent. of 31 rats were saved.

lxii. Brooks (R. St. John). **The Opsonic Index in Plague Vaccination.** pp. 373-386. With 5 charts.

The author contributed a paper on this subject to the *British Medical Journal* (see this *Bulletin*, No. 6, p. 318). Charts are now given in which it is seen that the opsonic curve falls nearly to zero on the fourth day after inoculation, but the immunity curve remains high for weeks.

lxiii. MacConkey (A. T.). **The Preparation of Antitoxic Plague Sera.** pp. 387-402.

The most constant preparation, which was used as a test toxin, was obtained by mixing plague bacilli with anhydrous sodium sulphate, melting the solid mass which formed at 37° C., stirring, and solidifying in a shallow basin cooled by ice. This crystalline product was dissolved in 0·85 per cent. salt solution at 36° C., cooled at 0° C., and filtered immediately before use.

Filtrates of broth cultures are unstable and weak. Solutions of plague nucleoprotein give anomalous results unless they are fresh; in the dry condition also, it was unreliable.

Considerable difficulties were experienced. In the first place 30 per cent. of the rats survived the dose of toxin which was fatal to the rest; paradoxical results occurred, for example 1 cc. of a

serum failed to neutralise 3 minimum lethal doses of toxin, but 0·04 cc. was sufficient. Although the serum was not poisonous when quantities as great as 10 cc. were injected, yet many rats which had recovered from the immediate effects of the toxin-serum mixture, died later in a condition of marasmus.

The toxin used for immunisation of horses was freshly prepared solution of plague nucleoprotein, and the dose is given in milligrams of nucleoprotein contained in it. One horse in three months received 1,340 mg. of fresh toxin, equal to 4,000 rat M.L.D., or the growth from 380 Roux bottles; it yielded a serum of which 1 cc. neutralised 400 rat M.L.D. Another horse was immunised with 3000 mg., or the growth from 860 Roux bottles; the titre of its serum was 150 only, hence the individuality of the horse is a factor in immunisation. In the case of horses which have been immunised already, old weakened toxin appears to stimulate the production of antitoxin better than fresh toxin, and causes less constitutional disturbance.

An attempt was made to increase the value of the serum by Gibson's method which is used in concentrating diphtheria antitoxin. On mixing equal volumes of serum and half saturated solution of ammonium sulphate a precipitate forms; this is collected and extracted with brine; the brine filtrate is precipitated with 0·25 per cent. acetic acid. The precipitate is collected, made alkaline with sodium carbonate and is dialysed against water. There was an increase in the antitoxic value of some plague serum thus treated to the extent of one and two thirds, but on the whole there was a loss of one third of the antitoxin.

Summary.—

"1. It is possible to obtain a plague antitoxic serum by means of injections of toxin obtained from the plague bacillus by Rowland's sulphate process. So far however the antitoxic value has not been high. The usual neutralising power has been 300-400 rat M.L.D. per c.cm. and on only one occasion was a value of 750 M.L.D. reached.

"2. In an immunised horse one obtains a better response, as regards antitoxin production, if one uses an old weakened toxin instead of a fresh toxin.

"3. Plague serum retains its antitoxic properties for months unimpaired.

"4. Heating at 56° C. for ½ hour on each of three successive days has no effect on the antitoxin.

"5. Plague antitoxin may be concentrated by the same process that is used for concentrating diptheria antitoxin."

C. Birt.

Signorelli (E.) & Caldarola (P.). **Ricerche di Agglutinazione con Differenti Razzi di Bacilli della Peste.**—*Annali d'Igiene Sperimentale.* 1912. Vol. 22. (New Series.) Part 4. pp. 555-567.

The following cultures of the *B. pestis* were used:—

1. "Kharbin," isolated from a case of pneumonic plague in February 1911.
2. "Mukden" from pneumonic plague in March 1911.
3. "Martini" from a septicaemic case of pneumonic plague.
4. "Bombay" from bubonic plague in 1897.

5. "Mongolia" from a case which occurred in an epidemic of bubonic and pneumonic plague at Weitschang in 1898.
6. "Wladimirowka" in the Astrakhan bubonic epidemic of 1900.
7. "Odessa" from a bubonic epidemic in 1910.

Emulsions of 48-hour cultures of these were heated for 45 minutes at 65° C. and injected into rabbits in three or four increasing doses at a week's interval. The animals were bled seven days after the last inoculation.

The *B. pestis* forms stalactitic growths in broth; hence such cultures are unsuitable for agglutination tests; but by growing the bacillus on agar at 35° C. for twenty-four hours, followed by incubation at 15° C. for another day, uniform emulsions can always be obtained.

In every instance the serum of the rabbit clumped the culture with which it had been immunised in higher dilution than those necessary to clump the other strains. Thus the Kharbin serum clumped the Kharbin emulsion in 1:75 and the Bombay strain in 1:15 dilution. Similarly the Bombay serum diluted 75 times agglutinated the Bombay bacillus, but had no effect on the Kharbin bacillus in dilutions higher than 1:30.

The result of the investigation showed that there are no very substantial differences in the agglutinability of races of *B. pestis* isolated from cases in various parts of the world.

C. B.

Epidemiology.

i. Guiteras (Juan). **La Peste Bubónica en la Habana.**—*Anales de la Acad. de Ciencias de la Habana.* 1912. Oct. Vol. 49. pp. 339-348.

ii. Vázquez (Antonio Cueto y). **Historia Clinica de Tres Casos de Peste Bubónica.**—*Ibid.* pp. 348-361.

iii. Agramonte (Aristides). **Peste Bubónica. Consideraciones Bacteriológicas.**—*Ibid.* pp. 361-365.

iv. Capote (Fernando Méndez). **La Peste y la Acción de la Casa de Salud "La Purisima Concepción."**—*Ibid.* pp. 365-370.

i. A translation of this paper appeared in the *Journal of the American Medical Association* (see this *Bulletin*, Vol. 1, No. 6, p. 314).

ii. Case 1. The onset, on June 30th 1912, was marked by fever and pains in the head and legs. Inguinal buboes appeared, accompanied with much surrounding infiltration; the *B. pestis* was isolated from the serum obtained by puncturing the glands. Pyrexia, 38° to 40° C., continued for 6 days. Recovery ensued though convalescence was retarded by suppuration of the femoral glands which were incised on the 16th day of the disease.

Case 2. The attack began on July 8th with chilliness, headache, vomiting, and fever. *B. pestis* was present in the serum aspirated from an inguinal bubo. Death took place on the fourth day and was preceded by dyspnoea and cyanosis.

Case 3. The illness commenced on July 14th with symptoms which suggested enteric fever. The blood withdrawn on the seventh day of the disease was negative to cultural tests, but the *B. pestis* was found in the serum obtained from an enlarged inguinal gland. Areas of inflammation of the skin appeared, from which the plague bacillus was procured; death supervened on the fourteenth day from adynamia.

iii. The bacilli isolated from the above three cases were shown to be those of *B. pestis* by means of cultures, complement deviation, and animal inoculation.

iv. Details are given of the precautionary measures against plague which were taken in the Institution "La Purisima Concepcion" after the occurrence of the three cases. None of the inmates were attacked.

C. B.

DEMINSKY (J.). **La Peste d'Astrakhan est-elle Endemique?**—*Vestnik Obstchestvennoi Guiguieny.* 1912. Sept. p. 1329: and *Bull. de l'Office Internat. d'Hyg. Publique.* 1912. Dec. Vol. 4. No. 12. pp. 2268-2269. (Abstract.)

*The author does not agree with the views of BELILOVSKY and KONSTANOV who maintain that plague is not endemic in Astrakhan, but that it is imported by the Mohammedan pilgrims; for, he asks, if that be so why are not the other Mohammedans in Russia attacked? He notes that plague appears almost exclusively in the sandy areas of the eastern steppes, and from a study of the spread of the disease during the last ten years he comes to these conclusions:—

1. Camels play no small part in the diffusion of plague in the Kirghis steppes; they may contract the infection and convey it to man.
2. The transmission of plague from camel to man may be explained by the fact that the Kirghis consume the flesh of camels slaughtered on account of illness.
3. It is possible that other domestic animals are also infected.
4. There is a close connection between the infection among the Kirghis and the steppes, more especially in the sandy districts.

This connection has been demonstrated by him in a most tragic manner, for while examining suspected ground-squirrels found on the steppes, he infected himself and died of pneumonic plague at Rakhinka on the 22nd of October last. He was nursed by his pupil KRASSILNIKOV who fell a victim to the disease five days later.

C. B.

BROWNE (R. H. J.). **A Case of Plague at Shotley.**—*Statistical Report on the Health of the Navy for the year* 1911. 1912. Oct. pp. 173-176.

A seaman cut his left forefinger while he was cleaning a rabbit which had been caught on the Ipswich road; he also touched

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* Summarised from the abstract in the *Bulletin de l'Office Internationale d'Hygiène Publique.*

another, the diseased appearance of which caused it to be rejected. Three days afterwards, on October 10th, 1911, he was attacked with fever, temperature 104° F., pains in his left axilla, where a bubo was found, and in his head, legs and back; malaise, anorexia, and vomiting and a slight cough were also noted. Pneumonia came on; the sputum contained *B. pestis* which caused the death of two guinea-pigs from plague in 6 and 7 days. The axillary bubo was incised; the wound became gangrenous; suppuration of the cervical glands supervened; iritis attacked both eyes, which ended in destruction of one, and much opacity of the cornea of the other. His temperature still fluctuated above normal limits twelve weeks after the onset of the illness. On the thirteenth day he received 50 million bacilli which had been isolated from his blood withdrawn on the tenth day; a double dose was given on the fifteenth day of the disease.

The place where the infected rabbit was caught is about three-quarters of a mile from the houses where the cases of plague occurred in 1910 reported by Bulstrode. It was known that a plague epizootic existed among the rats of the district at the time the seaman was infected.

C. B.

i. Guthrie (J. Birney). **Symptoms and Clinical Diagnosis of Bubonic Plague.**—*Southern Med. Jl.* 1913. Mar. Vol. 6. No. 3. pp. 155-157.

ii. Wilson (R. L.). **The Diagnosis of Plague.**—*Ibid.* pp. 157-160.

i. Early cases in an epidemic of plague are often overlooked; therefore in all febrile diseases it is necessary to examine the lymphatic glands and, if plague be suspected, the fluid withdrawn by puncture should be submitted to bacteriological tests. Venereal buboes, mumps, malarial and enteric fevers may be confused with plague.

ii. In this concise account of the methods employed in the diagnosis of plague there is no record of any personal observations.

C. B.

Transmission.

Martin (C. J.). **The Horace Dobell Lectures on Insect Porters of Bacterial Infections. Lecture ii. The Transmission of Plague by Fleas.**—*British Med. Jl.* 1913. Jan. 11. pp. 59-68: and *Lancet.* 1913. Jan. 11. pp. 81-88.

In the year 1897 Ogata induced plague in mice by inoculating them with crushed fleas taken from a plague-infected rat. In the following year Simond proved that plague is conveyed from animal to animal through the agency of fleas by placing a healthy rat confined in a box provided with a grating in a bottle with an infected rat; though the animals could not come in

contact the healthy rat contracted the disease, which was transmitted by fleas introduced into the bottle. In 1902 GAUTHIER and RAYBAUD made five similar successful experiments. In 1904 VERJBITSKI achieved success 19 times in 116 attempts. Since that date the Commission for the Investigation of Plague in India has repeated and extended these researches, the reports of which have been published from 1906 onwards. The Commission ascertained that the *B. pestis* may occur in thousands in the stomach of rat-fleas, where they multiply and can be recovered till the twentieth day after the flea's meal on the infected rat. The faeces of the insect contain the micro-organism, which may enter the skin of man or animal through the flea-bite or the slight injuries caused by scratching. Sixty-six experiments were performed, in each of which 40 to 70 animals, some infected with plague and the rest healthy, were confined together; in 31 of these experiments in which fleas were excluded none of the healthy animals became infected, although in one case 21 plague animals were in close contact with 25 normal rodents. On the other hand, in 35 experiments in which fleas were introduced, epizootics of plague broke out among the healthy animals. Guinea-pigs and monkeys placed in infected animal houses remained free from plague when their cages were surrounded with a 6 inch strip of "tangle foot" fly-paper which was sufficient to ward off fleas, though 6 of 13 monkeys, and 18 of 24 guinea-pigs whose cages were unprotected died. Fleas rapidly forsake their dead host and betake themselves to man or other animals. Guinea-pigs do not harbour fleas as a rule, but they are convenient traps for rat-fleas. The infectivity of 142 houses where plague had arisen, or rat mortality had been noted, was tested by turning guinea-pigs loose in them; in 31 instances the animal died of plague. Ninety-two experiments were made in which two animals were placed in suspected houses, one being protected by gauze or "tangle foot"; 15 of the unprotected but none of the protected animals died. The fleas captured on the animals were carriers of the *B. pestis*, for on 26 occasions in 96 tests plague developed in the animal to which they had been transferred.

The rat-flea of the tropics is *Xenopsylla cheopis*, which BACOT has bred for years on human blood. The common rat-flea of temperate climates is *Ceratophyllus fasciatus*. MARTIN and CHICK find that this species attacks man as readily as rats, for 60 per cent. of 517 attempts to feed these fleas on the human subject were successful. Martin however thinks that it is doubtful whether the *C. fasciatus* is attracted to man as readily as *X. cheopis*: it is not such an active jumper as the latter.

The *Ctenopthalmus agyrtes*, a flea commonly found on *Mus decumanus* in country places in Great Britain, refused to bite man in 107 experiments. The mouse-flea, *Ctenopsylla musculi*, only occasionally fed on the human being in 122 attempts. Martin notes that though plague epizootics occur among mice they are not associated with plague epidemics.

The seasonal prevalence of bubonic plague in rats and men is marked. In Bombay the height of the epidemic is in March, in

Lahore in April, in Jhelum in May, in Rawal Pindi in June, and further north in July to September. This is not due to periodicity in the breeding of rats, but is connected with periods when fleas are most numerous. Curves are given of a census of fleas captured on 150,000 rats, of epizootics among *M. decumanus* and *M. rattus*, and of human plague, in which it is seen that plague is epidemic when the average number of fleas is above the mean, and the height of the epidemic corresponds with the season when fleas are most abundant. In this respect observations in India, Japan, Sydney, North China, and Marseilles are concordant. Epidemics of plague decline when the mean daily temperature exceeds 85° F. ,for such a temperature in the absence of moisture kills fleas. In the Indian experiments 67 per cent. of attempts to convey plague by fleas were successful when the temperature was 73° to 78°, but only 14 per cent. when the temperature was 82° to 85° F.

Though it is possible to convey plague experimentally by means of *Pulex irritans*, yet this flea plays little or no part in the spread of plague at the present day, for the invasion of the blood by the *B. pestis* in the human infection is so much less than in the case of the rat that the chance of a human flea taking in a single bacillus is small.

The author summarizes the claims of flea transmission to be the predominating mechanism of spread from rat to man as follows:—

"1. The experimental evidence that plague is easily transmitted from animal to animal by rat-fleas.

"2. That in presence of fleas, the epizootic, if started, varies as regards severity and rate of progress with the number of fleas present and the season of the year, whereas all attempts to induce epizootics in the absence of fleas have failed.

"3. That under natural conditions (experiments in plague-houses, &c.) an animal can be protected from infection by any simple procedure which will exclude the visits of fleas.

"4. The only discovered infection in plague-houses resides in plague-infected fleas.

"5. Rat-fleas, *X. cheopis* and *Ceratophyllus fasciatus*, readily bite man.

"6. The conclusions drawn from animal experiments, when applied to the problem of the spread of plague amongst human beings, afford a reasonable interpretation of every cardinal epidemiological fact."

C. B.

Treatment.

D'Hostalrich. **Du Traitement de la Peste et de la Valeur Curative du Sérum Yersin.**—*Rev. de Méd. et d'Hyg. Trop.* 1912. Vol. 9. No. 4. pp. 225-227.

Bubonic plague prevailed in the district of Phanthiet, Annam, from February to August, 1908. According to native official reports the number of people that fell victims was not less than 2,000. Of 232 cases under the care of the author 21 were treated symptomatically, only 6 of which recovered. 190 patients received daily subcutaneous injections of 40-80 c.c. of Yersin's

anti-plague serum; 128 died, which is equal to a mortality of 67·7 per cent. Large doses of serum, up to 100 cc., were given intravenously to 16 patients, who were suffering from severe infection, but four only survived. Five grave cases were submitted to a course of serum therapy, venesection, and intravenous injection of saline fluid; three recovered. There were four recoveries in nine patients to whom serum was administered within the first forty-eight hours of their illness, which was serious in all. Hence it exerts some beneficial effect if its administration is begun soon after the onset; if it be delayed till the third day or later, no good results.

C. B.

Prophylaxis.

Beck (J. E.). **Prophylaxis of Plague.**—*Southern Med. Jl.* 1913. Mar. Vol. 6. No. 3. pp. 161-165.

Vessels plying between infected ports should be fumigated every three months, and moored six feet or more from the wharf, and their cables should be protected with conical galvanized iron rat-guards three feet in diameter.

At Honolulu plague was endemic, but for several years the town has been kept free by the continual warfare on rats, and by the isolation of cases. When an infected rat is discovered, the house in which it was secured is searched immediately, and rendered rat-proof; the residents are placed in quarantine. On one of the other islands of the group, where the same energy is not displayed in the campaign against plague, cases occur frequently.

Secrecy and inactivity are costly and dangerous. The authorities of a city in the Western States denied the existence of the disease in their midst and threatened personal violence to their Health Officer who reported it. Millions of dollars were afterwards spent in attempts to suppress the infection.

C. B.

Heiser (Victor G.). **Plague. A Note in Regard to Infected Houses.**—*U.S. Public Health Rep.* 1913. Mar. 7. Vol. 28. No. 10. pp. 426-427.

At Manila on December 17, 1912, two guinea-pigs free from fleas and confined in a wire cage were placed for three hours on the sleeping mat of a man who had contracted plague. Four days later one of the animals died of plague, but no fleas were discovered on it. Two houses in which plague had occurred were disinfected by spraying with kerosene and washing with a larvicide; guinea-pigs then introduced remained healthy.

C. B.

Rats and Rat Plague.

Creel (R. H.). **The Rat. Its Habits and their Relation to Anti-plague Measures.**—*U.S. Public Health Rep.* 1913. Feb. 28. Vol. 28. No. 9. pp. 382-386.

A gray rat (*M. norvegicus* vel *decumanus*) was released 450 feet from the shore of San Juan Bay; it reached land in six minutes. Another swam 1,300 feet to the beach in fifty-five minutes, the first fifteen of which were spent in swimming round before it learnt its course. A *M. decumanus*, a *M. rattus*, and a *M. alexandrinus* survived 90, 45, and 35 minutes in the water respectively when they were set free 1,200 feet from land. They appeared to have no sense of direction.

In 48 hours five *M. decumanus* had burrowed downward through two and a half feet of firm soil to the circumference of a stockade made of galvanized iron sunk into the ground for a distance of 3 feet. The depth of their natural burrows is usually half to one foot, but they have been found passing beneath a wall two feet in depth. They are able to pierce lime-mortar and soft brick, but cement and concrete obstruct them. *M. rattus* and *M. alexandrinus* did not burrow when they were confined in the stockade.

A 12 inch band of zinc encircling the trunk of a cocoa-palm prevented rats from climbing the tree, but they ascended with ease a 1-inch standpipe. In one instance a *M. rattus* escaped from a smooth iron receptacle 24 inches deep.

The best bait for rats is the food to which they have been accustomed. *M. rattus* and *M. alexandrinus* have fewer cannibalistic proclivities than *M. decumanus* which it is difficult to preserve in captivity for this reason.

Summary.—

"The *Mus norvegicus*, while essentially a burrowing animal and not addicted to climbing or swimming, is nevertheless quite capable of doing either. It burrows readily in the hardest earth, even to the depth of two and a half feet, and can pass through, probably by gnawing, all wooden material, soft brick, or mortar. The black rat and the Alexandrinus (at least in Porto Rico) do not burrow at all, but are very adept at climbing and jumping, and therefore are the species chiefly found in the rural districts, removed from human habitations.

"It is possible for rats to escape from ships anchored a quarter or even half a mile from shore and make a landing, the water being smooth and tide favourable. It is questionable whether rats under natural conditions would make the attempt, though unusual conditions aboard ship might determine this kind of migration."

C. B.

Rucker (W. C.). **The Relation between Traffic and the Spread of Plague.**—*U.S. Public Health Rep.* 1913. Jan. 24. Vol. 28. No. 4. pp. 163-166.

It is axiomatic that the prevention of bubonic plague depends on the prevention of the migration of rodents in traffic. Vessels,

while tied to the wharf, must be debarred from receiving or discharging rats. The rat-guards must be fixed perpendicularly to the mooring cables, and must be of such a diameter that rats are unable to leap over them. Docks and ships should be constructed with bolt-holes supplied with swing doors operated from above, into which the rats can be enticed or driven by smoke, steam, sulphur dioxide, or other means, and there despatched. In the absence of these contrivances, fumigation of ships by sulphur dioxide, or carbon monoxide is the most effective means of destroying the rodents. They may be dislodged from life-boats by a jet of steam.

C. B.

MARKL. **Bakteriologische Diagnose der Rattenpest.** [Bacteriological Diagnosis of Rat Plague.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Dec. 30. Vol. 67. No. 5. pp. 388-397.

SKCHIVAN reported that an epizootic in rats, which preceded an epidemic of plague at Odessa, was caused by the *B. mucosus caps.* and the *B. coli.* ZLATOGOROFF experienced difficulty in distinguishing the effects on rats of an infection due to *B. pseudotuberculosis rodentium* from those of plague; this organism is ubiquitous and is found in dust, earth, and fodder; it gives rise to glandular enlargements and effusions into the serous cavities of rats, and it is agglutinated by plague serum. AUJEZKY ascertained that a plague-like disease in rats was caused by a variety of Friedländer's rhinoscleroma bacillus; TOYAMA, SCHILLING, SACHS, and XYLANDER have studied other varieties of this group which are pathogenic to rodents. KISTER and SCHMIDT isolated one of the haemorrhagic septicaemic group of organisms from ferrets in an epizootic which occurred in Hamburg; guinea pigs were infected when cultures were applied to their shaven skin. Danysz' bacillus and its allies, *B. issatschenko, B. bristolense,* described by KLEIN, and the bacillus of NEUMANN, one of the German swine-plague family, cause fatal disease in rats, in which the post-mortem appearances bear some resemblance to those of plague (*see* this *Bulletin.* No. 2. p. 72.) The micro-organisms of this group are easily separated from plague by cultural tests.

If the body of a plague-rat be examined shortly after death, inspection with the naked eye is often sufficient to determine the cause of the infection. If however putrefaction has set in, the difficulty of diagnosis is much increased. Markl finds that all indications of plague are lost in guinea-pigs when their cadavers are kept at a temperature of 26°-28° C. for five to seven days. His observations harmonize with those of KISTER and SCHUHMACHER, ZLATOGOROFF and others. As the tissues become decomposed, the polar staining of the *B. pestis* grows more indistinct; many of the contaminating bacteria may present a resemblance to plague bacilli. Cultures fail almost invariably, from overgrowth of the

plates with proteus. Nevertheless DUNBAR and KISTER obtained colonies of the plague bacillus on gelatine plates which had been incubated at 18° C. for five days, after inoculation with highly putrescent material derived from plague rats. To obviate death from sepsis in animal experiments, the putrid matter is applied to a shaven and slightly abraded surface of skin on a guinea-pig's abdomen; but this method does not always succeed, since the virulence of the *B. pestis* is lowered by association with putrefactive bacteria.

Fifty dead rats were found in a ship with a cargo of Indian produce; their bodies were far advanced in decomposition when they were examined by Markl, who inoculated six guinea-pigs on the shaven skin, hypodermically, and intra-peritoneally. They all survived except one which had received intraperitoneal and subcutaneous injections of the putrid matter. The *B. pestis* was isolated from its blood by gelatine culture and animal passage. Twenty rats which had been dead for a long time were removed from the hold of another ship which had come from South America: guinea-pigs survived skin inoculation with the decomposing tissues, but succumbed to peritoneal and subcutaneous injections. Friedländer's bacillus was obtained on culture, and was the probable cause of the rat epizootic.

Two cases of plague occurred on board a ship bound from Syria; dead rats had been found in the hold. Markl discovered the appearances of plague in one, but skin inoculation of guinea-pigs was without result. He isolated the *B. pestis*, however, from the decomposing remains of another rat by culture, and subcutaneous and peritoneal inoculation of a guinea-pig.

C. B.

ANDERSON (John F.) & MCLAUGHLIN (Allan J.). **A Plague-like Organism from a Rat.**—*Amer. Jl. Public Health.* 1913. Jan. Vol. 3. No. 1. pp. 50-52.

A rat was killed in Key West, Florida, the post mortem appearances of which somewhat resembled those of plague. There were dusky injection of the skin, slight enlargement of the inguinal glands, pleuritic effusion, yellowish areas and spots in the liver, congested spleen, and a nodule in the lung. Cultures from the lung, liver, and spleen resulted in the growth of a motile bi-polar staining rod, which fermented glucose but left lactose unchanged. Inoculation by the cutaneous or subcutaneous method killed rats and guinea-pigs. A white rat which had received an injection of anti-plague serum before inoculation died before the control animal. Though the organism grew well on salt agar, no involution forms were observed. The bacillus belonged to the Gärtner group.

C. B.

Bulletin Épidémiologique (Peste 1912).—*Bull. de l'Office Internat. d'Hyg. Publique.* 1912. Dec. Vol. 4. No. 12. pp. 2316-2323; and 1913. Vol. 5. Nos. 1 and 2.

The following table shows the distribution of plague during 1912, with the number of cases reported and the mortality:—

Localities.	Months.	Cases.	Deaths.
AFRICA:			
The Azores	Sept.–Oct.	37	22
Algiers	July	6	6
Alexandria	March–Nov.	33	15
Cairo	April–May	4	3
Port Said	May–Dec.	12	3
Egyptian Provinces ...	Jan.–Dec.	802	389
Morocco	May–Sept.	11	—
Senegal	May	4	3
Mauritius	Jan.–Dec.	642	416
Natal	Jan.–July	33	26
German E. Africa	March	69	69
British E. Africa	Aug.–Dec.	162	103
AMERICA:			
Cuba	July	4	2
Granada	May	1	1
Porto-Rico	June–Sept.	53	33
Buenos Ayres	Oct.	3	3
Brazil	Jan.–Dec.	70	57
Chili	"	63	25
Ecuador	Feb.–Dec.	233	82
Peru	Jan.–Dec.	722	299
Port of Spain	April–July	12	7
Venezuela	March–Nov.	10	7
ASIA:			
Arabia	Jan.–June	22	21
Hong Kong	Jan.–Sept.	1,848	1,729
China	Jan.–Dec.	408	396
India	1st Jan. 1912–4th Jan. 1913.	324,276	274,804
Java	1st Jan.–31st Dec.	2,240	2,022
Indo-China	Jan.–Dec.	2,171	1,547
Persia	Feb.–June	968	730
Siam	Jan.–Oct.	28	28
Straits Settlements ...	"	46	34
Turkey (Asiatic)	Feb.–July	20	6
Japan	March–Aug.	189	143
EUROPE:			
Hamburg	Sept.	2	1
Trieste	July	2	2
Liverpool	April and July	2	1
Tyne	Sept.	1	1
Kirghis Steppes	Oct. 1911–Feb. 1912	211	190
Russia (including Asiatic)...	Jan.–Dec.	233	190
OCEANIA:			
New Caledonia	Sept.-Nov.	25	16
Hawaii Islands	Feb.–Dec.	8	8
Philippines	April–Dec.	58	50

C. B.

LEPROSY.

Transmission.

Noc (F.). **Remarques et Observations sur le Rôle des Moustiques dans la Propagation de la Lèpre.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 787-789.

Referring to a paper published by him in the *Annales d'Hygiène et de Médecine Coloniales*, 1903, Vol. 6, p. 483, Noc points out that he never found acid-fast bacilli in mosquitoes (*Culex* sp.?) which had been allowed to feed on lepromata, but frequently found typical lepra-bacilli in mosquitoes caught in the rooms or on the mosquito-nets of lepers. In view of the facts that some mosquitoes prefer to feed at night, and that in his experience the temperature of lepers rises in the evening, with an increased chance of bacillaemia at that period, he considers that one should not be dogmatic in regard to the improbability of mosquitoes carrying the infection, until one knows more of the habits of such kinds as occur in leper-establishments. He has frequently found lepra-bacilli in the stomachs of domestic flies caught in the neighbourhood of ulcerated lepromata.

J. Henderson Smith.

Leboeuf (A.). **Dissémination du Bacille de Hansen par la Mouche domestique.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 860-868.

Flies (*Musca domestica*) settle frequently on leprous ulcers left exposed, and of 23 flies caught on such ulcers known to contain many bacilli 19 were found to contain typical organisms. The bacilli were present in very large numbers sometimes, were excreted in the faeces of the flies and showed no signs of degeneration even after a day or more in the intestine of the fly. Even in flies caught in the room and not directly on the ulcers bacilli were found but less frequently; while in 8 flies caught elsewhere no similar acid-fast bacilli were observed. While *M. domestica* would thus appear to be capable of disseminating the bacillus, it apparently can be infected only from patients who present open lesions (or infected discharges); e.g., *B. leprae* was not found in 29 flies caught in the rooms of patients with only nervous symptoms or with unbroken skin lesions. Further, it was not found in 23 flies caught in a house about 160 yards from the pavilions containing advanced cases, which is taken as suggesting that the range of dissemination is not very great. Two flies of another species (*Lucilia* sp.?) were found infected on a patient with open ulcers. Leboeuf considers that transmission of the disease may occur through infected flies depositing their faeces on the nasal orifices or cutaneous wounds, perhaps especially during sleep.

J. H. S.

Skelton (D. S.) & Parham (J. G.). **Leprosy and the Bed-Bug.** —*Jl. R. Army Med. Corps.* 1913. March. Vol. 20. No. 3. pp. 291-292.

The authors examined in two experiments the bed-bugs (*Cimex lectularius*) caught in the beds at Walezo Leper Asylum (Zanzibar). In the first experiment 75 live bugs were used and, after several hours' washing of the animals in normal saline, films were made of the teased intestinal contents. In the second experiment 100 live bugs were similarly washed, the fluid centrifuged and films made of the deposit. The bodies of the bugs were then ground into a powder and films of this examined. In no case were definite acid-fast bacilli seen, and only a few acid-fast granules and some doubtfully acid-fast rods were observed in some of the films of the first experiment. Bed-bugs living under natural conditions in leper beds were thus not found to contain any bacilli resembling the lepra organism, and it seems improbable that they play an important part in the transmission of the disease in Zanzibar.

J. H. S.

Sorel (F.). **Recherche du Bacille de Hansen dans les Ganglions de Personnes Saines vivant dans l'Entourage des Lépreux.**—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. 698-702.

Sorel punctured a lymphatic gland (inguinal, cervical or epitrochlear) in 19 cases of manifest leprosy, and 8 times found the bacilli. In a similar examination of 15 persons living in close association with lepers but not apparently themselves affected, he obtained one positive result in an inguinal gland of a healthy married woman with a healthy child, a native of the Ivory Coast.

J. H. S.

Sugai (A.) & Monobe (J.). **Ueber die Vererblichkeit der Lepra und einiger anderen Infektionskrankheiten.** [The Hereditary Transmission of Leprosy and some other Infectious Diseases.] —*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Dec. 30. Vol. 67. No. 5. pp. 336-337.

In 10 out of 12 children, newly born of leprous parents, lepra-bacilli were found in small numbers in the circulating blood, and in 9 in that of the placentae also. The bacilli were also found in the blood of a newborn child, of whose parents only the father was leprous.

After intravenous injection into pregnant guineapigs of an emulsion of lepra-bacilli, whether boiled or not, the authors found in 48 hours the bacilli in the heart-blood of all the foetuses. Tubercle bacilli were found in the blood of foetuses of guineapigs similarly injected. In the semen of a guineapig, into whose testes tubercle bacilli were injected, the bacilli were demonstrated 4 days later, and a female with which it paired was found 11 days later to have tubercle bacilli in its uterus and to have a tuberculous endometritis.

Intravenous injection of *B. coli* or *B. typhosus* into pregnant guineapigs, or of *Staphylococcus aureus*, was followed by the appearance of these organisms in small numbers in the blood of the foetuses.

[No details are given as to the methods of identifying the acid-fast or other organisms used, nor as to precautions against the well-known fallacies to which such work is liable.]

J. H. S.

Diagnosis.

Bayon (H.). **The Present Position of Leprosy Research.**—*S. African Med. Rec.* 1912. Nov. 9. Vol. 10. No. 21. pp. 463-471.

An account of a previous paper by the same author, which covers much the same ground as this, was given in this *Bulletin*, No. 4, p. 195. An additional interesting point is the statement, based on experience with 126 cases of leprosy, that the injection of a filtered diluted extract made from Kedrowsky's culture produces in early cases of the disease an intra-dermal reaction, which is of use to confirm the diagnosis. The reaction consists of a typical areola which develops at the site of injection within 24 hours. Advanced cases and normal individuals give no such reaction, but nodular cases show a rise of temperature (up to 104° F.) after the injection of 1 cc. or more of the extract. Bayon considers that the employment of a simple vaccine made of the bacilli, killed but not otherwise treated, can be of no service in this disease, since such organisms are not broken up in the tissues and no antibody formation can result.

J. H. S.

Paldrock (A.). **Eine einfache Methode, Leprabacillen in der zu untersuchenden Haut nachzuweisen.** [A Simple Method of Demonstrating Lepra-Bacilli in the Skin.]—*Dermatologisches Centralbl.* 1913. Jan. Vol. 16. No. 4. pp. 101-103.

Paldrock recommends a simple procedure, which he says gives more satisfactory results than even the somewhat elaborate mincing and filtering method of Unna or the antiformin method of Koslow. The excised portion of skin is washed in distilled water till no more blood comes away, is then laid upon filter-paper to drain off the excess of water, and is finally picked up with forceps and smeared upon coverslips, pressure being exercised to express the juice and the bacilli from the piece of tissue. The coverslips are then dried in the air, fixed in the flame and stained in the usual way. Many bacilli may be found in such films in cases where the usual serum-preparation shows none or almost none.

J. H. S.

Joyeux. **Notes sur la Lèpre en Haute-Guinée.**—*Rev. de Méd. et d'Hyg. Trop.* 1912. Vol. 9. No. 3. pp. 161-163.

Advanced cases conform fairly to the disease as seen elsewhere, and on a rough estimate about one person in every 200 shows

obvious leprosy. Joyeux tried the ophthalmo-reaction of Calmette and von Pirquet's skin reaction on 10 cases of definite leprosy, using tuberculin, and obtained a positive result in one case with the Calmette test. This case still gave a positive reaction one year later, although no signs of tubercle could be discovered. The most satisfactory method of diagnosing early cases is the recognition of the bacilli in the nasal mucus during an attack of acute coryza (in artificially induced coryza they were not seen). He saw no examples of rat-leprosy in a considerable number of animals examined.

In a discussion on this paper Jeanselme stated that the positive Wassermann reaction sometimes obtained in lepers does not disappear under salvarsan treatment.

J. H. S.

Clinical.

Paravicini. **Contribution au Diagnostic Clinique de la Lépre dans la Haute Cote-d'Ivoire.**—*Rev. de Méd. et d'Hyg. Trop.* 1912. Vol. 9. No. 2. pp. 132-136.

A condensed account of the clinical symptoms in both the nervous type and the less common leonine or tuberculous type, at different stages, with some points of differential diagnosis. The author points out that the frequently symmetrical distribution of the lesions in the tuberculous form does not necessarily imply an alteration in the medulla.

J. H. S.

de Beurmann & Labourdette.—**Lèpre Nerveuse contractée en Indo-Chine. Facilité de la Contagion.**—*Bull. et Mém. de la Soc. Méd. des Hôpit. de Paris.* 1912. Dec. 19. 3 sér. Vol. 28. No. 36. pp. 741-746.

In commenting on a case of which a detailed account is given, the authors point out that while ocular lesions are much more frequent, more severe, and more intractable in the nervous type of leprosy, the lesions of the eye and especially of the cornea due to the local development of a leprome are often susceptible of satisfactory treatment. When such lesions are present, however, there is serious danger in using such therapeutic agents as leprolin, of whatever sort. Leprolins may and sometimes do induce a local congestion, which goes on to ulceration and cicatrisation, but this process occurring in the eye might lead to permanent blindness. The circumstances of the case detailed were such that infection apparently occurred in spite of a minimum of opportunity, and the authors use this to insist on the facility with which leprosy may be transmitted on occasion.

J. H. S.

de Beurmann, Ramond (Louis), & Larroque. **Lèpre Tuberculeuse, Gigantisme et Acromégalie.**—*Bull. et Mém. de la Soc. Méd. des Hôpit. de Paris.* 1912. Dec. 19. 3 sér. Vol. 28. No. 36. pp. 714-726.

A detailed description of a case of leprosy which presents also definite signs of acromegaly. The leprosy is almost purely

tubercular, the very slight disturbance of sensibility found in a small proportion of the tubercular areas being insufficient grounds for speaking of it as of mixed type. The tubercles are extremely numerous, the only skin areas free from them being the regions covered with hair, and show a tendency to a symmetrical distribution; but there is no syringomyelia and no evidence of extensive involvement of the nervous system. The facies is of leonine type, and the diagnosis, obvious at first sight, was confirmed by the demonstration of numerous lepra-bacilli in an excised tubercle. The acromegaly is definite but not pronounced. It is chiefly confined to the hands and feet, which are greatly enlarged in all dimensions with marked lengthening of the digits but there is also enlargement of the sella turcica, some enlargement of the frontal sinuses and elongation of the vertical line of the head and face. The authors discuss the possible relationship of the two conditions, but conclude that it is really a case of gigantism in course of evolution into acromegaly, with leprosy superadded as a complicating factor.

J. H. S.

TREATMENT.

PALDROCK (A.). **Sollen Leprakranke mit Salvarsan behandelt werden?** [Should Leprosy Cases be treated with Salvarsan?] —*St. Petersburger Medizinische Zeitschr.* 1912. May 1 (14). Vol. 37. No. 9. pp. 135-141.

Nine cases were treated with salvarsan, viz., 6 of lepra tuberosa, 2 of lepra maculosa and 1 of lepra nervorum, all being cases of long standing. The drug was given in acid solution in doses of 0·3-0·6 gm. intramuscularly, and the local reaction was effectively controlled by immediately applying compresses over the injection and keeping them there for 6 days. In all, 26 injections were given, 2 cases receiving 4 injections, 5 receiving 3, and the others 2 and 1 respectively. Three of the injections were followed by local necrosis; in no case did albumin appear in the urine. The injections were followed by a marked general improvement with increase in weight, local skin-lesions improved, tubercles softened, and ulcers healed rapidly. But the improvement was temporary only, and was followed by an acceleration of the progress of the disease, and Paldrock concludes that treatment by salvarsan alone cannot be recommended in cases which have already existed for some years.

In 4 of the cases the treatment was complicated by the injection of fresh complement-containing serum from animals. Paldrock was led to try this by the statement of ELIASBERG that the serum of lepers is deficient in complement. Increasing doses from about 35 cc. to over 100 cc. were given subcutaneously, each patient receiving in all from 285-325 cc. of serum. For successive injections the serum of different animals was used to avoid the dangers of anaphylaxis. Small doses produced no apparent effect, but the large doses were followed by urticaria, rise of temperature, shivering and general depression. No benefit appears to have followed this procedure.

J. H. S.

MINETT (E. P.). **The Treatment of Leprosy by Nastin and Benzoyl Chloride.**—*British Guiana Medical Annual for* 1911. Eighteenth Year of Issue. pp. 24-33. [1913. Demerara: printed by The Argosy Co., Ltd.]

Eighteen selected cases had been under treatment with Nastin for nearly 2 years and six under treatment for from 6-9 months, before further treatment with benzoyl chloride was begun. These cases were compared with 71 cases, unselected, treated only with benzoyl chloride, and with 8 other cases left untreated. Each group included cases of nodular, anaesthetic and mixed leprosy. The benzoyl chloride treatment consisted in intramuscular injections of a 5 per cent. solution of the drug in sterilised white oleum petrolatum, and in addition a 2·5 per cent. solution was used as a spray for the nose and was painted upon ulcers and broken down nodules. The latter method of using the drug was found to be very useful, the discharges being quickly rendered free from bacilli. The intramuscular method was found to be of doubtful utility. The percentage of improvement with it was indeed slightly higher than with Nastin, which the author finds to have very little beneficial effect on cases of leprosy, but he is inclined to attribute what improvement there was to the mental effect of the new treatment and to the improved conditions of life obtained in the asylum. Anaesthetic cases run a definite course, after which the disease seems to die out and leave the patient no longer infective. Sensation may in time return to some of the previously anaesthetic areas, and after self-amputation only scars remain. This is a natural process and is not apparently influenced by either Nastin or benzoyl chloride. Nodular cases do not tend to improve naturally, except in very rare instances, and do not appear to be appreciably affected by either method of treatment. The so-called destruction of bacilli occurs in patients who have not been treated at all, varying from time to time and in different situations in the same patient. It is an unreliable guide to the effect of a given treatment.

J. H. S.

SCHUMACHER. **Zur Behandlung der Lepra mit Nastin.** [The Treatment of Leprosy with Nastin.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Jan. Vol. 17. No. 1. pp. 15-17.

The effect of Nastin was tried on four natives of German East Africa, all of whom suffered from mild skin leprosy of long standing. All four received subcutaneous injections weekly, at first of Nastin B_1 for 8 weeks, and then after 14 days' interval of Nastin B_2 for 16 weeks. No general reaction was observed at any time and no reaction at the site of injection. A favourable change occurred in the spots on the skin and in the nasal lesions. The skin spots, which were originally reddish-brown in colour and showed a margin raised here and there by small nodules, at first became much darker, and soon after the B_2 preparation was commenced became distinctly black. The margins became bright red, marking off the whole spot sharply from the surrounding skin, and these in turn also eventually became black, while

in the centre of the spots small areas of normal skin appeared which gradually coalesced. Two months after the last injection the spots could be recognised only by the small nodules, which had also become dark and were softer. The improvement in the nasal mucous membrane was definite, it became smooth and moist with no ulceration or scabs, and lepra bacilli could no longer be found in the discharge. Observation of the cases unfortunately could not be continued.

J. H. S.

RUTHERFOORD (T. C.). **Report on Cases of Leprosy treated with Leproline during 1911-1912 in the Bilaspur District.** (Mirror.) —*Indian Med. Gaz.* 1913. Feb. Vol. 48. No. 2. pp. 61-66. With 1 plate.

In all 32 cases occurring in natives of India were treated, but the results here given affect only 20 of these. The shortest period of treatment was 100 days, and 15 were treated for 153 days. Full details of each case with notes on its progress are given. Taken over all, it appears that 2 cases were unaltered in condition, in 15 cases deterioration was indubitable, and in 3 cases it was impossible to decide whether there had been on the whole improvement or deterioration. In the absence of a large number of controls it would be unfair to attribute the preponderance of cases that got worse to the treatment. The author considers that the deterioration was probably due to the natural progress of the disease and that the treatment did not affect it one way or the other, but in one at least of the cases the downward progress was so very marked that it is difficult not to hold the treatment as at least partially responsible. The leproline used appears to have been the preparation of ROST; it was given usually in doses of 1 cc., injected weekly.

J. H. S.

PAPELLIER (E.). **Das Luetiker Bad Kusatsu in Japan.** [The Syphilis Baths at Kusatsu.]—*München. Mediz. Wochenschr.* 1912. July 30. Vol. 59. No. 31. pp. 1718-1719.

The Kusatsu bath lies on a plateau about 4,000 feet above the sea and is the most celebrated of a cluster of some 30 hot springs which rise in the high mountain range North-West of Tokyo. Nearly a dozen separate springs issue at Kusatsu at a temperature of 60°-63·9°, and they vary considerably in the proportions of the mineral constituents they contain. One type for example contains 0·719 gm. $Al_2(SO_4)_3$ and 2·152 gm. free H_2SO_4 per litre, and another type has only 0·035 gm. $Al_2(SO_4)_3$ but 2·618 H_2SO_4. The water is led from these springs into public bathing places and to the hotels which constitute the main part of the town. The season for visitors lasts from June to September, the district being covered with snow in the winter. In the public baths the temperature of the baths is 57°-58°, and as this is too high even for a Japanese the ritual of the bathing procedure commences by all the assembled bathers stirring the water for

10 minutes. This induces a free perspiration and also reduces the temperature of the water to about 50°, at which point all pour the water over themselves, and at a given signal all plunge into the bath. After 3 minutes' immersion the bath is over and in a complete course this process is repeated 3-5 times daily for 5-6 weeks. The free acids produce in visitors (not in the local inhabitants) oedema of the sensitive parts and excoriations of the skin which become very painful, and it is usual after a Kusatsu course to visit a neighbouring spring to accelerate the healing of these lesions of the skin. Used chiefly as a cure for syphilis, Kusatsu is also frequented by lepers with, it is said, good results and even cures in early cases. There is a separate leper quarter and the lepers do not mingle with the other visitors, but the separation is not rigidly enforced and the slight precautions taken illustrate the indifference with which leprosy is commonly regarded in Japan. According to official statistics Japan has 102,585 lepers (probably an underestimate), and until recently there were no official institutions for their treatment. Even now there are only 4 or 5 asylums in the country, which can of course admit only a small fraction of the number of persons infected.

J. H. S.

Leboeuf (A.). **La Curabilité et les Rémissions de la Lèpre en Nouvelle-Calédonie.**—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 705-707.

To illustrate the difficulty of disinguishing between cure and temporary recovery Leboeuf gives 4 instances of a more or less complete remission of symptoms, which relapsed after 2, 5 and 7 years. In 6 other cases, however, he considers it probable that cure had really taken place, no relapse having occurred for in one case 8, in another case 10, and in the remainder about 15 years. Jeanselme in the discussion stated that he had performed an autopsy on a leper who had had no symptoms for 4 years, and found no other changes than vascular and interstitial sclerosis.

J. H. S.

Lepra bacilli in the Blood and Excreta.

Rabinowitsch (Marcus).—**Leprabacillen im kreisenden Blute der Leprakranken und im Herzblutes eines Leprafötus.** [Lepra Bacilli in the Circulating Blood of Patients and in Heart-Blood of a Lepra-Foetus.]—*Berlin. Klin. Wochenschr.* 1913. Feb. 10. Vol. 50. No. 6. pp. 252-253.

Ten cc. of blood were withdrawn from a vein in 8 patients, of whom 5 were cases of lepra tuberosa, 2 of lepra maculosa, and 1 of lepra nervorum. The blood was added to 10 cc. distilled water containing 1 per cent. sodium citrate and some sapotoxin, and after shaking was centrifuged. To the deposit, after washing in distilled water, was added 10 per cent. antiformin solution, and after 1 hour at 37° the mixture was again centrifuged, the deposit washed and finally spread on films. The blood of 5

patients was repeatedly examined in this way, and in 3 cases of lepra tuberosa lepra bacilli were found every time, in one case of nervous type only once, and on no occasion in a case of lepra maculosa. The remaining cases were examined only once, and in 2 of these, both of tubercular type, bacilli were found. They were also demonstrated in the heart-blood of a foetus of about the 6th month, found post-mortem in one of the cases of lepra tuberosa, although no signs of leprosy were apparent in the foetus itself.

J. H. S.

Sugai (T.) & Monobe (J.).—**Die Leprabacillen in der Milch von Leprakranken.** [Lepra Bacilli in the Milk of Lepers.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Dec. 11. Vol. 67. No. 4. p. 233.

In 6 out of 10 cases examined lepra-bacilli were found in the blood, and in 2 of these also in the milk. In the one case they were present from the 6th month of pregnancy on, in small numbers. In the other case they were most numerous in the milk immediately after the birth of the child, but could occasionally be detected for months afterwards. The milk-glands of 2 lepers were also examined histologically and in both lepra-bacilli were detected.

J. H. S.

Lagane (L.). i. **Bacillurie provoquée dans la Lèpre.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 784-786. ii. **Bacillurie Lépreuse.**—*Compt. Rend. Soc. Biol.* 1913. Jan. 10. Vol. 74. No. 1. pp. 16-18.

i. The urine was systematically examined in three cases (1) of old mixed leprosy; (2) of mixed leprosy with symptoms of 3 years' standing and recent development of tubercles; (3) an early case with sense-disturbances and spots. In all three the bacilli were found in the local lesions, and in the first two also in the nasal mucus irregularly, but never in the blood in any of them. Bacilli were not found in the urine in spite of repeated trials, whether examined after aspirin or potassium iodide had been given or in the absence of drugs. The second and third cases were injected intravenously with arseno-benzol in doses of 0·5 and 0·6 gm. every 5-7 days, with an interval of 15 days between the 3rd and 4th injections. After the 2nd, 3rd and 5th injections in the 2nd patient acid-fast bacilli were found in large numbers in the urine, identical microscopically with lepra-bacilli and not producing tuberculosis in guineapigs, and after the 3rd and 5th injections in the 3rd patient (whose nasal mucus always gave negative results). The urine contained no albumin and no blood, and the reaction of Meyer was negative.

ii. Lagane here describes a case of six years' standing which suffered from frequent febrile attacks with formation of multiple tubercles. In the urine of this case, which had been receiving arseno-benzol, lepra-bacilli were found ten days after the last injection, but the appearance of the bacilli coincided with an

acute attack of fever and a very pronounced development of tubercles. The attack lasted 20 days and the bacilli were present throughout this period in the urine. Their presence might be associated with the previous arseno-benzol treatment; but Lagane found bacilli in slides made from the urine of the same patient during an attack before the arseno-benzol treatment was begun, and he considers that the bacilluria was due to the acute attack and not to the arseno-benzol. Further, in a case of 10 years' duration, of mixed type and showing visible tubercles, he twice detected typical bacilli in the urine although no arseno-benzol had been given at any time. There was no blood or albumin in the urine nor any signs of renal leprosy or tuberculosis; the organisms were typical in all respects and were never obtained from the blood even during the acute attacks. Bacilluria, then, can exist in leprosy but is irregular, and so far as is yet known only after the administration of arseno-benzol or in tubercular cases either with ulcerative lesions or during an acute attack.

J. H. S.

MERIAN (Louis).—**Positiver Leprabazillenbefund in den Fäzes bei an Leprösen Schleimhautveränderungen des Kehlkopfes leidenden Patienten.** [Lepra-Bacilli in the Faeces in Cases of Leprosy of the Laryngeal Mucosa.]—*Dermatologische Wochenschr.* 1913. Mar. 8. Vol. 56. No. 10. pp. 269-271.

The author examined the faeces of 3 cases of lepra tuberosa, of which one showed very advanced lesions in the nose and larynx, the second some congestion of the nasal mucous membrane and false vocal chords with some whitish nodules, and the third had no apparent lesions in this region. In the stools of the last he found no lepra-bacilli at any time; in the first he found a considerable and in the second a still larger number. The large number present in this second case was surprising, and Merian attributes it to the influence of potassium iodide which had recently been given in large doses. The bacilli did in fact disappear from later stools, of which he examined six in each case.

J. H. S.

ANIMAL INOCULATION EXPERIMENTS.

STANZIALE (Rodolfo).—**Nouvelles Recherches sur les Inoculations de Matériel Lépreux dans la Chambre antérieure de l'Oeil des Lapins. iiie Communication.**—*Lepra.* 1912. Nov. Vol. 13. No. 2. pp. 87-105. With 7 plates.

Stanziale has injected lepra bacilli into the anterior chamber of the eye in 31 rabbits. Into 12 of these the material injected was fluid and consisted of the juice of lepromata obtained by aspiration or of juice obtained by extracting fragments of leprous tubercles in salt solution. In none of these 12 did any multiplication or growth occur, although the fluid injected was rich in lepra bacilli. Into the remaining 19 pieces of leproma tissue were injected, and in eight of these a positive result was obtained. The conditions essential for success are difficult to determine, but

apparently the chances are increased if the portion injected is of some size, and also if it is quite fresh, although positive results were obtained with tissue injected 19 hours after its removal from the patient. The tissue-fragment injected at first increases in size owing to imbibition of fluid and exsudative reaction around it, but after a time begins to diminish again. This regressive change goes on to nearly complete absorption in negative experiments. In the positive cases, however, it is checked some 30-60 days after the inoculation, and the fragment again increases in size, until in 3-4 months it may be 7-8 times as large as at first, and of a grey or reddish tint. At the same time small nodules or points develop on this mass or on the parts in the immediate neighbourhood. The vessels of the iris undergo a development in the early stages, but this subsides in time, and brick-red infiltrations of the iris appear, which gradually coalesce and constitute new formations, lying, it may be, some distance from the original mass. These are genuine granulomata and contain many acid-fast leprabacilli, which the author considers are certainly due to local multiplication. Similar nodules may develop in the cornea, should the original mass as it increases in size come to touch its posterior surface. Rabbits in which positive growth has been obtained give a positive Wassermann reaction. In view of the differences of opinion regarding the Wassermann reaction in rabbits this point is not insisted upon, but Stanziale has never seen a positive reaction in normal rabbits nor in animals inoculated in the anterior chamber with pieces of normal skin or with lepromata sterilised by heat.

A commission was appointed by the Royal Academy of Medicine and Surgery of Naples to examine Stanziale's specimens and data and in its report, which is appended to the paper, it is stated that there can be no doubt that multiplication of the bacilli had taken place and that he had produced small tumours of granulomatous structure, rich in bacilli, in both cornea and iris.

J. H. S.

Organisms cultivated from Leprous Lesions.

Kritschewsky (J.) & Bierger (O.). **Zur Frage über das Verhältnis des *Bacillus leprae* Hansen zu einigen bei Lepra gezüchteten Mikroorganismen.** [On the Relationship of certain Organisms cultivated from Leprous Cases to the *B. leprae* of Hansen.]—*Zeits. f. Hyg. u. Infektionskrank.* 1913. Vol. 73. No. 3. pp. 509-547.

The writers, who are assistants to Kedrowsky, have tested the complement-binding power of leper sera when combined with extracts made from Kedrowsky's lepra culture, Duval's organism, *B. tuberculosis*, *B. typhosus* and one of the acid-fast butter-bacilli, Korn I. They used 28 sera and note that their power of spontaneously deviating complement did not increase, even on prolonged keeping. Of these sera 13 were from cases of lepra tuberosa, 7 of lepra mixta and 8 of lepra nervorum. The extracts were made by Leuch's method, and the authors insist that the

results noted in the literature as having been obtained with ether or alcoholic extracts must be rejected, since deviation with such extracts may not be specific. The extracts they made from *B. typhosus* did not bind complement with any of the 11 sera they tried, and the extracts of the butter-bacillus gave binding only occasional and always very slight, which they attribute to a possible group reaction.

With Kedrowsky culture all but one of the tuberosa sera gave strong complement-binding. So also did all of the sera from lepra mixta, and 5 of the 8 lepra nervorum sera. In the nervous cases, however, a considerably higher dose of serum was necessary to obtain a strong reaction, and possibly if sufficient serum had been available for the experiments, the three negative sera would have proved positive with the higher quantities. In 2 of the lepra mixta sera the reaction was less pronounced than with the others, and these cases were clinically close to the nervous type of the disease. The weak reaction in nervous cases is to be associated with the small number of bacilli present in the tissues in such cases and the smaller tissue reaction. After injection of lepromatous tissue into rabbits and a monkey (*Cercopithecus sabaeus*) the serum of these animals gave a positive fixation reaction with Kedrowsky extract. Special precautions were taken and controls carried out to ensure that the tissue injected contained no other organisms than Hansen's bacilli. In one patient, who was treated with a "leprin" made from Kedrowsky's culture on the lines of Old Tuberculin, the reaction became weaker after the treatment.

With Duval's culture on the other hand only 2 of the sera gave a strong positive reaction. In 7 cases a very slight or doubtful reaction was obtained, due perhaps to a group reaction. A special investigation with the sera of rabbits immunised to the two cultures showed that the relationship between them is not very close, much less so than that between Kedrowsky culture and *B. tuberculosis*. Extract of tubercle bacilli gave a positive reaction with 8 out of 11 sera tested, the results corresponding to the reactions with Kedrowsky extract; and tubercle extract reacted with the sera of rabbits immunised to Kedrowsky. A few agglutination experiments were done, and of 9 sera tried 4 agglutinated Kedrowsky culture feebly, 2 agglutinated *B. tuberculosis* very feebly, and none affected Duval culture.

J. H. S.

Smith (Allen J.) & Rivas (D.).—**The Culture and Biological Characteristics of Lepra Bacillus.**—*New Orleans Med. & Surg. Jl.* 1912. Oct. Vol. 65. No. 4. pp. 265-273.

The authors obtained from Duval an organism isolated from a leper nodule, which they examined in some detail. It was one of the chromogenic bacilli growing on gelatin, described by that author. Smith and Rivas used a medium consisting of white of egg that had been exposed to the action of trypsin, and also a peptone solution similarly trypsinised, and found both media very satisfactory for the growth of this organism. The authors also state

that they obtained from at least two cases of leprosy a growth of acid-fast organisms. The material used to inoculate their (trypsinised) medium was blood from a nodule, blood from the finger or toe, and in at least one case "venous blood." Growth resulted in all cases, but the acid-fast organisms were not obtained in pure culture. In the blood from the toe they found not only acid-fast bacilli grouped in the manner of *B. leprae*, but also lepra cells filled with acid-fast bacilli, the organisms being present both in endothelial cells and lymphocytes. They look upon this as definite evidence that bacteriaemia exists in leprosy. [It is not always possible to follow exactly what the authors did or mean, but apparently their organisms were never obtained in pure culture, and whether they correspond to one another or to the organism of Duval is not indicated.]

J. H. S.

Currie (Donald H.), Clegg (Moses T.), & Hollmann (H. T.). **Cultivation of the Bacillus of Leprosy.**—*Lepra.* 1912. Nov. Vol. 13. No. 2. pp. 71-86.

Up to the present time the authors of this paper, either independently or in association with one another or with Brinckerhoff, have succeeded in growing acid-fast bacilli in symbiosis with cholera and amoebae at least 16 times from 15 cases of leprosy, and have isolated these bacilli in pure culture 7 times. A detailed description of the cultural characters of six of these pure cultures is given in the present paper. With trifling exceptions they agree with one another, and the six cultures may be regarded as different strains of one organism. They also give for comparison a similarly detailed account of the cultural characters of *B. margarin*, *B. smegmae* and one of Moeller's grass bacilli, and these three organisms correspond very closely to the "lepra" cultures—so closely that it is doubtful whether the differences that do exist are sufficiently definite or constant to justify a distinction. *B. margarin* in particular resembles the "lepra" strains exceedingly closely. The serum of a horse, however, that had been immunised to 4 of the lepra strains, agglutinated all the lepra organisms, but none of the three other acid-fast bacilli, which can therefore be distinguished from the lepra organisms. The authors recognise that the only evidence they have so far produced of their "lepra" bacilli being the cause of leprosy lies in the frequency with which they have been able to isolate it from cases of the disease, its acidfastness and morphology, and in this serological evidence that it is not one of the common saprophytes. [It seems a pity therefore that they should insist on calling the organism *B. leprae* in the meantime, an unwarranted use of the term which only adds to the confusion already sufficiently great in this subject.] A summary of previous attempts to isolate and grow the bacillus of Hansen is given.

J. H. S.

BAYON (H.). **The Bacteriology of Leprosy.**—*Jl. London School of Trop. Med.* 1912. Dec. Vol. 2. Part I. pp. 65-73.

A statement of the present position of this controversy from the point of view of the writer, which has already been more than once brought before the readers of this *Bulletin.* No additional facts are given.

J. H. S.

BAYON (H.). **Ein neuer Nährboden für die Kultur und Isolierung von parasitischen oder schwach saprophytischen Bakterien. Eine Bemerkung zu der Arbeit von Creighton Wellman.** [A New Medium for the Isolation and Cultivation of Parasitic or Feebly Saprophytic Bacteria. A Note on the Paper of Creighton Wellman.]—*Centralbl. für Bakt.* 1. Abt., Orig. 1913. Jan. 23. Vol. 67. No. 7. pp. 591-592.

Bayon points out that the placental-extract medium, recommended by Creighton WELLMAN for the growth of *B. leprae,* had been described by KEDROWSKY in 1901, who also used it for the isolation of Mycobacterium tuberculosis. The organism which Creighton WELLMAN names *B. leprae* is in Bayon's opinion an ordinary chromogenic saprophyte of the type of MOELLER's Mistbacillus, having nothing to do with leprosy.

J. H. S.

MACHOW (D.). **Zur Frage über Kedrowski's "Leprakultur."** [On Kedrowski's Lepra-Bacillus.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Jan. 11. Vol. 67. No. 6. pp. 434-446.

An account of an examination of the organism isolated by KEDROWSKI from lepers, by cultural methods and animal experiment. Machow confirms the statements that it presents marked differences in form according to the medium on which it is grown, and shows that it can by careful training be made to grow on ordinary media. Its acid-fast character may be lost in the course of this procedure, but is regained on injection into animals. For white mice it is apparently pathogenic, more so than for rabbits, and produces lesions which have not much resemblance to tuberculosis and are suggestive of leprosy. The organism may be included in the same group as the tubercle bacillus, but does not present a close similarity to the latter. Machow is of opinion that the organism cannot be rejected on the grounds advanced by some authors and that further investigation is to be desired.

J. H. S.

KRAUS (R.), HOFER (G.), & ISHIWARA. **Ueber Differenzierung von Leprabazillen mittels Bakteriolyse. (Zur Frage der Bakteriolyse säurefester Bakterien.) 3. Mitteilung.** [The Differentiation of Lepra Bacilli by means of Bacteriolysis.] —*Wiener Klin. Wochenschr.* 1913. Feb. 27. Vol. 26. No. 9. pp. 319-321.

In previous papers the authors showed that tubercle and some other acid-fast bacilli underwent an intense bacteriolysis in the

peritoneal cavity of infected guineapigs, and that the serum of such animals could produce a similar action in the peritoneal cavity of normal guineapigs. They now state that the two strains of organisms known as Duval's and Kedrowski's, for both of which the name of *B. leprae* has been claimed, are like the other acidfast bacilli in this respect. In both cases the serum of immunised or injected guineapigs produced lysis of the corresponding organism in normal guineapigs and lysis occurred in the peritoneum of animals injected with the living organism previously. Duval serum, however, had no effect on Kedrowski bacilli, nor Kedrowski serum on Duval bacilli; and no lysis occurred of the one kind when introduced into the peritoneum of an animal previously injected with the other kind. As the injection of living lepra-bacilli of either kind does not produce any infection, local or general, in rabbits or guineapigs, the authors conclude that it is not necessary for the production of lytic substances that a lesion should be produced in the injected animals, such as has been considered essential for other antibodies in the case of tubercle. By this method they can separate the two cultures from one another as can be done by the ordinary cultural means, but they point out that it is not yet decided that either is the cause of leprosy, and Kraus failed to get a reaction in actual cases of the disease.

J. H. S.

In the *Bulletin de la Société de Pathologie Exotique*, 1912, Dec., Vol. 5, No. 10, p. 774, it is announced that a Commission, consisting of MM. Borrel, Jeanselme, Marchoux and Pinoy, has been appointed by the Society to make a comparative study of the numerous organisms which are alleged by different observers to be the causal agent of leprosy.

J. H. S.

Rat Leprosy.

Ishiwara (T.). **Ueber die Rattenlepra.**—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Jan. 11. Vol. 67. No. 6. pp. 446-450.

The author had occasion to examine in Korea 7,001 rats of various species, viz., *M. decumanus, rattus, alexandrinus, indicus* and *Apodenus minutus japonicus*. The relative numbers of these kinds, of which he gives a short description, were 34·2 per cent.; 24·8 per cent.; 24·0 per cent; 13·0 per cent.; and 3·6 per cent. respectively. Five animals presented macroscopic appearances resembling leprosy, but only in two, both *decumanus*, were acid-fast bacilli found.

J. H. S.

Marchoux (E.) & Sorel (F.). **Le Lepra des Rats** (*Lepra murium*). —*Lepra.* 1913. Jan. Vol. 13. No. 3. pp. 171-206.

Although the fact is not stated, this is the same paper as that published in the *Annales de l'Institut Pasteur*, and already summarised in this *Bulletin* (No. 4, p. 202).

J. H. S.

Unclassed.

Sugai (T.) & Monobe (J.). **Ueber histologische Befunde in der Placenta Tuberkulose-und Leprakranker.** [Histological Observations on the Placenta in Cases of Tubercle and Leprosy.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Dec. 11. Vol. 67. No. 4. p. 232.

Seven cases of tuberous leprosy and four of the nervous form were examined, and seven cases of tuberculosis. As well as in other parts of the placental tissue lepra bacilli were observed in the hyalin areas and sometimes in considerable numbers, but in this locality tubercle bacilli were not met with. The authors look on the hyalin material or fibrin as a regressive substance derived from blood-clot, and suggest that the presence of lepra bacilli in it, where tubercle bacilli are not found, indicates that the former are anaerobes.

J. H. S.

Sugai (T.). **Ueber die viscerale Lepra.** [Leprosy in the Viscera.] —*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Dec. 11. Vol. 67. No. 4. pp. 230-231.

An abbreviated account of the distribution of the bacilli and other pathological changes in the organs, based on the post-mortem examination of 11 male and 2 female lepers. Special attention was directed to the reproductive system.

J. H. S.

Pringault (E.). **Contribution à l'Etude Hématologique de la Lèpre.** —*Arch. de l'Inst. Pasteur Tunis.* 1912. No. 4. pp. 228-232.

Blood counts in 4 cases of lepra tuberosa. All showed some diminution in the number of red cells, which vary from 3,546,000 to 4,187,000, with a low colour index, numerous hematoblasts and a marked irregularity in size of the cells. The white cells are also reduced in number (6,500-8,020), with presence of myelocytes in all the cases (up to 3·1 per cent.), relative polymorphonuclear leucocytosis in 3 of them, and a slight eosinophilia (4·18 per cent.) in one. The neutrophil polymorphonuclear cells arranged according to the scheme of Arneth show a preponderance of those with 3 nuclei, and the nuclear index is higher than normal.

J. H. S.

Paldrock (A.). **Untersuchung der Jakutenspeise auf Leprabacillen.** [Examination of the Food of the Yakoots for Lepra-Bacilli.] —*Sitzungsberichte der Naturforscher-Gesellschaft bei der Universität Jurjew.* [Dorpat.] 1912.

It is a current local belief that the Yakoots (inhabitants of Eastern Siberia) contract leprosy from eating diseased or rotten fish, and one at least of the practitioners resident in this region

is convinced that the spread of leprosy is directly due to the eating of "Soma." This article of diet consists of small fish which are thrown into ditches or troughs and, some milk having been poured over them, are then left to ferment until the arrival of the first frosts converts the mixture into a solid block. During the winter the Yakoot chops from the frozen mass the desired amount and cooks it with milk or beer, the final product having an odour so powerful that even horses can scarcely be got to approach the houses at meal-time. There are two or three other ways of preparing fish for eating, and Paldrock examined some 4 samples of such articles for the presence of leprosy bacilli but found none.

J. H. S.

Barbézieux (G.). **La Prophylaxie de la Lèpre en Indochine.**—*Bull. Soc. Méd.-Chirurg. de l'Indochine.* 1912. Nov. Vol. 3. No. 9. pp. 598-606; No. 10. pp. 643-653.

La Lutte contre la Lèpre au Tonkin.—*Ann. d'Hyg. et Méd. Colon.* 1912. Oct.-Nov.-Dec. Vol. 15. No. 4. pp. 751-760.

An account of the quite inadequate arrangements at present in force in Tonkin for the segregation and care of lepers, and a suggested scheme for establishing properly organised asylums with as little restraint and confinement of the inmates as possible.

J. H. S.

Roux (M.). **Quelques Réflexions sur la Lèpre à propos du Rapport de M. le Docteur Barbézieux.**—*Bull. Soc. Méd.-Chirurg. de l'Indochine.* 1913. Feb. Vol. 4. No. 2. pp. 64-69.

Leprosy as it exists in our time is not a disease with pronounced tendency to diffusion or to violent epidemic explosions, and M. Roux considers that elaborate schemes for the segregation of those infected with this disease are largely misdirected efforts, which might be more usefully employed in the study of its treatment and the discovery of a cure.

J. H. S.

Sudhoff (Karl). **Dokumante zur Ausübung der Lepraschau in Frankfurt a. Main im XV. Jahrhundert.** [Documents relating to the inspection of Leprosy in Frankfort in the 15th century.]—*Lepra.* 1913. Jan. Vol. 13. No. 3. pp. 141-170.

In the Middle Ages there existed on the Continent of Europe a number of local centres, such as Vienna, Köln, Strasburg, where a pronouncement recognised as authoritative could be obtained on the presence of leprosy in any suspected case, and we have here an interesting collection of official letters and documents of the second half of the 15th century illustrating the system in use at Frankfurt at that time.

J. H. S.

ZAMBACO. **La Lèpre dans l'Antique Egypte.**—*Presse Médicale d'Egypte.* 1913. Feb. 15. Vol. 5. No. 4. pp. 57-59.

Leprosy was well known in Egypt before the exodus of the Hebrews. It appears to have been derived from India, its ultimate cradle being central Asia, and was spread widely by the Phoenicians, among whom it was so common that morbus Phenicius signifies leprosy. No doubt many other cutaneous diseases were confused with it, and probably the disease from which Asariah suffered was syphilis, but it is believed on anatomical grounds that Ptolemy II. (285-247 B.C.) was infected with leprosy.

J. H. S.

UNDULANT FEVER.

CARRIEU (M.) & ANGLADA (J.). **Comment peut-on rendre moins Incertaine la Valeur Diagnostique de la Séro-réaction d'Agglutinement du** *Micrococcus Melitensis?* — *Presse Médicale.* 1912. Nov. 2. No. 90. pp. 909-911.

The authors describe the difficulties and the contradictory results of workers in this branch of scientific diagnosis. They show how certain cultures give reactions with normal serums, and state their belief that the test has been much over-estimated. What is the cause of this non-specific agglutination? Is it a spontaneous agglutination of non-motile bodies, does it depend on the age of the culture, the presence of an alexin, or the action of the leucocytes? The false agglutinations are most commonly obtained when using febrile serums and in dilutions up to 1/80. They criticise NÉGRE and RAYNAUD for using the microscopic method; they prefer the macroscopic.

The rest of the paper is divided into three parts. The first deals with results obtained when varying dilutions are used, the works of WEILL and MENARD, SAISSAWA, GARDON, ROUSLACROIX, DANLOS and others being quoted. The consensus of opinion is that high dilutions are necessary for accurate results. The authors fix the minimum at 1/200, higher dilutions being even better. In the second part the varying agglutinating powers of different strains are considered, especially with regard to non-specific serums. With these the reactions may occur at from 1/10 to 1/200, whereas with specific serums the variations are very slight; that is to say, the irregularities found with non-specific serums disappear almost entirely when specific serums are used; they think therefore that for diagnosis every serum should be tested with many strains before a positive opinion is formed.

In the third part NÉGRE and RAYNAUD's method of heating the serum to 56° C. for half an hour is criticised, a method which according to these observers cuts out all non-specific reactions, leaving intact the specific. With the authors this was not always the case, but they believe that the method has a very high diagnostic value.

Finally, they state that agglutination in the case of *M. melitensis* is inferior in diagnostic value to that for *B. typhosus* and is less certain than haemo-culture or fixation of complement; but to render it less uncertain they propose a triple verification: by (1) the employment of high dilutions of the serum; (2) testing the serum with many strains; (3) heating the serum. The exclusive application of any one method they believe to be insufficient.

[If a minimum dilution of 1/200 is used, a large number of subacute undulant fever cases will be missed; with the use of a 1/50 dilution, and an emulsion made from a 48 hour growth of well attested agar cultures errors in results have been, in the writer's experience, very few.]

P. W. Bassett-Smith.

VALLET & RIMBAUD (L.). **Étude Expérimentale de l'Agglutination du *Micrococcus melitensis*.**—*Compt. Rend. Soc. Biol.* 1913. Feb. 21. Vol. 74. No. 7. pp. 323-324.

A resumé is given of some experimental work with the *M. melitensis*, relating to agglutination reactions obtained by using different methods, several laboratory animals, and four strains.

(i) It was found that with healthy guinea-pig serum agglutination was not obtained in higher dilutions than 1/20. In rabbits it often rose to 1/50; of 21 healthy dogs 18 reacted, once in 1/20, five times in 1/100, seven times in 1/200, once with 1/300 and four times with 1/400; one strain was twice agglutinated at 1/600. Heating the serum at 56° C. always prevented these reactions and the addition of fresh serum did not restore the agglutinating power.

(ii) Immunising the different animals with *B. typhosus*, *B. coli com.*, *Staphylococcus*, etc. did not cause any modification of the agglutination reaction.

(iii) Intravenous injections of cultures of *M. melitensis*, killed by heating to 60°, into rabbits produced highly agglutinating serum, up to 1/3000; subcutaneous injections were less effective. Heating these serums to 56° C. caused the specific agglutinins to disappear in many of the animals, and reduced the activity in the remainder from 1/3000 to 1/200.

(iv) The agglutinability of different races of the *M. melitensis* with normal serums was very variable; certain serums agglutinated one strain in dilution of 1/400, without causing any reaction of the other three. The serum of an animal immunised by one strain generally agglutinated the other strains, but not always. The highest agglutination reaction was not necessarily obtained with the strain which had been used to immunise the animal. When the heating did not destroy the specific agglutinating power, the amount of agglutinability of the different strains, before and after heating, was not proportional.

P. W. B.-S.

RONCHÈSE (A.). **Sur le Séro-Diagnostic de la Mélitococcie avec des Cultures tuées par le Formol.**—*Compt. Rend. Soc. Biol.* 1913. Feb. 7. Vol. 74. No. 5. pp. 210-212.

Two cases of infection with the *M. melitensis* having recently occurred in his laboratory, WIDAL caused emulsions killed by formalin to be used. A series of experiments was carried out by the author to show if such emulsions would give as good results as the living emulsion. His results are interesting. Emulsions from cultures three days old were made and two drops of formalin were added to every 15 c.c. Tests were made by the microscopic method, with unheated serum in dilution of 1/10, 1/50, 1/100, and 1/200 using living emulsion, killed emulsion two months old, and the same one year old. All gave positive reactions up to 1/100 and none with 1/200, but curiously the rapidity of the action was greatest in the one-year-old killed emulsion, and

slowest in the living. Tests were made to see if this rapid agglutinability would not render the reaction less specific. During the year a number of febrile conditions (30) were examined with the method; the results were all negative with a time limit of two hours. When heated serums were used, as recommended by Négre and Raynaud, the results were similar as to dilutions, but the time taken was rather longer than with unheated serum. The author concludes that the advantages of using emulsions killed by formalin are very considerable, and that these emulsions retain their properties for at least a year and probably longer.

P. W. B.-S.

Bassett-Smith (P. W.). **The Diagnosis and Treatment of Undulant or Mediterranean Fever.**—*Jl. of Hygiene.* 1912. Dec. Vol. 12. No. 4. pp. 497-505. With 2 charts and 1 plate.

Attention is drawn to the great reduction of this fever since the prophylactic measures recommended by the Commission of the Royal Society have been in force, and to the gradual extension of the disease into areas away from the sea, in France, Spain, etc. A short review is given of some of the recent work, in which agglutination methods have furnished very varying results. A series of tests was made with five separate strains of *M. melitensis*; three undulant fever bloods and 65 controls were used, and the emulsion in normal saline was made from a 48 hour old agar culture. Dilutions of 1/40, 1/100, 1/400, of both heated and unheated serums, were put up and the sedimentation method was used throughout. The tubes were placed in the 37° C. incubator for 48 hours, then read off, and again in 12 hours' time.

All three undulant fever serums reacted in high dilutions with all five strains; of the controls only in one was there a positive reaction and this was with the heated blood at 1/100; the percentage of error was therefore very low. In some chronic cases agglutination responses may not be given; therefore other methods must be used, which are mentioned. A series of complement fixation experiments was carried out, by a technique which is given; the number examined was small but the reaction was specific (25 cases). Attention is also drawn to the variability of the morphology of the organism, and the occurrence of streptococcic forms. Treatment by yeast and vaccines is recommended, and a chart is given of a case in which, apparently, the benefit from this method was very marked.

P. W. B.-S.

Scordo (Francesco). **Experimentelle Studien über die Therapie des Mittelmeerfiebers.** [Experimental Treatment of Mediterranean Fever.]—*Centralbl. f. Bakt.* 1 Abt., Orig. 1912. Dec. 4. Vol. 67. No. 3. pp. 151-164.

The author describes his investigations of experimental undulant fever carried out in the Institute of the University at Rome, under Prof. Bacelli, in the tropical section under Prof. Gabbi.

Three goats were infected by intravenous injections of *M. melitensis*, and after the infection had been proved to have been established by means of agglutination and blood culture tests, they were treated with intravenous injections of $HgCl_2$, the effects on the blood being carefully observed; these are shown in tabular form.

A resumé of the treatment by corrosive sublimate of other diseases is given (puerperal fever, scarlet fever, acute rheumatism, etc.). The goats were taken from the neighbourhood of Rome and were found to be as susceptible to the disease as Maltese goats. The author describes the care with which the animals were housed and kept, and how the blood of each was repeatedly examined before treatment; they proved to be free from disease. Each goat received 2 or 3 injections of the specific organism in a vein of the ear at intervals of 5 to 8 days. These caused a rise in the temperature, and definite serum reactions; the organism was also isolated from the blood. The formula for the sublimate injection (Bacelli's) was—

$Hg\ Cl_2$	1-2 gm.
$Na\ Cl$	8 gm.
H_2O	1000 c.c.

dose 1 to 10 c.c. injected intravenously every 3rd to 8th day.

The author notes the effect of the therapeutic injections on the temperature, milk, and blood in each case. The post mortems showed very few pathological appearances, slight splenic enlargement, some hyperaemia of the intestine, and enlargement of the mesenteric glands. He states that the injections have no harmful effect on the agglutinating elements, nor in all probability on the group of antibodies in the blood. He draws the following conclusions.—(1) The intravenous sublimate injections act chiefly on the blood corpuscles, increasing their number. (2) They cause an increase in the haemoglobin. (3) They produce a leucocytosis with an increase in the polynuclear cells. (4) They attack energetically the specific micro-organism, causing it to disappear from the blood and arresting further development of the fever.

The same method of treatment is now to be employed on man, and the results will be published.

[A germicidal preparation which will at the same time increase the number of the polynuclear leucocytes has long been sought as the most probable means of cure of undulant fever. These admirably carried out experiments are therefore of great value, but three cases are too few to draw definite conclusions from.]

P. W. B.-S.

Bassett-Smith (P. W.). **A Case of Para-melitensis Fever.**—*Jl. of Trop. Med. & Hyg.* 1913. Feb. Vol. 16. No. 4. pp. 50-51.

The work of Négre and Raynaud is referred to, which demonstrated the occurrence of an organism called the *Micrococcus para-melitensis*, differing only in its biological characters from the *M. melitensis* (*see* this *Bulletin*, No. 2, p. 76). The

case is described of a patient who contracted, at Hyères in the Riviera, an irregular fever associated with joint pains, neuritis, constipation, sweats, and loss of weight, in which the diagnosis lay between undulant fever and infective rheumatoid arthritis. A diagnosis of undulant fever was made from the clinical symptoms by several observers, but as it could not be confirmed, either by culture of the micro-organism from the blood or urine, by the agglutination reaction, or by the complement fixation method, no positive opinion could be given. After the disease had lasted two years, the blood was tested with *para-melitensis* organisms, received from NICOLLE, of Tunis, and was found to react in dilutions up to 1/400. At the same time it gave a negative reaction with five strains of *M. melitensis*. The reaction was confirmed by the use of the absorption method with the two organisms. This is the first case of this disease recorded, and the careful observations which have been made, extending over a long period of time, make it one of great interest.

P. W. B.-S.

LONGO (A.). **Contributo alla Conoscenza della Febbre di Malta nell' Etá Infantile.** [Contribution to Knowledge of Malta Fever in Infants.]—*Rivista Ospedaliera.* 1913. Jan. 15. Vol. 3. No. 1. pp. 3-14.

In a systematic examination of children attending his clinic at the university of Catania the author found five positive reactions to *M. melitensis* out of 100 cases. Two of these cases which were of special interest are reported. The first was an infant 7 months old with a month's history of fever; it was born of healthy parents and was partly suckled by the mother and partly fed on goats' milk; the latter is said to have been always boiled, but this was doubtful. The blood agglutinated strongly at 1/1000 and partially at 1/1500. The most noticeable feature of the case was the occurrence of tremors of the left side, lasting on and off for 10 days, apparently due to meningeal irritation.

The second case, an infant 28 months old, was more severely ill and the blood agglutinated also up to 1/1000. This case was remarkable for the association of cystitis, coming on spontaneously, and convulsive attacks, probably also meningeal in origin, from which the child died. There could be no doubt as to the diagnosis; the culture of *M. melitensis* had been lately isolated by ZAMMIT, and the serum reacted in high dilutions.

It is very rare to get infection of children under one year old; it is said to occur most commonly between 12 months and 3 years. TOMASELLI believes that suckling infants have a certain amount of immunity, and calls the type of undulant fever in infants "Febbre Sudorale." In the two cases quoted the nervous and urinary systems were markedly affected. Meningeal symptoms have been mentioned in children by CANTALOUBE and HAUSHALTER. The blood of Case 1 was carefully examined; it showed a moderate reduction in number of the red cells, an irregular leucopaenia 6000-3000 per c.mm., and a relative increase of mononuclears.

The blood picture then does not differ from that of adults, but CANNATA's and LUNA's findings do not agree with this and further researches are required. It is noteworthy that the infant who recovered was fed entirely by the mother during the course of the disease.

[Observations by EYRE and others have shown that the mother's milk at times contains the specific organism, and may thus infect the sucklings.]

P. W. B.-S.

SUAREZ DE FIGUEROA (José). **Co-operacion al Estudio de la Fiebre de Malta.** [Co-operation in the Study of Malta Fever.]—*El Siglo Medico.* 1913. Jan. 11. Vol. 60. No. 3083. pp. 22-23; and Mar. 8. No. 3091. pp. 151-152.

The author draws attention to the fact that very little has been done in Spain towards the recognition or study of undulant fever. RAMON Y CAJAL, DURÁN, and FLORES ESTRADA have each written describing the disease, but undoubtedly the occurrence of this fever is often overlooked in Spain through practitioners not being familiar with the symptoms, and the absence of laboratory assistance for diagnosis.

In Barcelona the disease is common and is often called "Barcelona fever," a term however which may include many other conditions; cases occur throughout the province, both in the coast towns and in the interior, at Villanova, San Felicé, Castelltersol, Rubi, San Pedro and San Juliá. FLORES ESTRADA has described a case from a town in Toledo, in the very centre of Spain. The author on a visit to Bitem in 1908 found seven cases of undulant fever in a population of 500. Cases have also been reported from the province of Gerona to the north of Barcelona and from Tortosa in the province of Tarragona in the south, and others in the district at the mouth of the Ebro.

The disease appears to be widely distributed throughout Spain; it is therefore very important that Spanish medical men should become better acquainted with the symptoms and methods used for diagnosis, to prevent the errors which are at present frequently made.

In his further remarks on the same subject the author suggests the propriety of substituting a single universally recognised name for Malta fever, for the various trivial ones under which this disease is known at different points on the Mediterranean littoral. He is of opinion that this would be very desirable both for statistical purposes and for the methodical recognition of the complaint. The point seems one that might well be taken up at one of the International Medical Congresses. As regards the clinical recognition of the disease, the author draws attention to the method of differentiation by the characters of the pulse proposed by L. MORPURGO (*Sociedad de Ciencias Médicas,* 1909), which runs as follows:—

Malaria.—Patient with a morning temperature of 36·5° C. and a pulse of 72; in the evening, temperature 39·5° C. and pulse 96.

Enteric.—Morning temperature 38° and a pulse of 84; mid-day temperature 38° and pulse 80; evening temperature 39° and pulse 96.

Malta fever.—Morning temperature 36·5° with a pulse of 100; evening temperature 39·5° and pulse 120 to 140.

From his own experience Suarez thinks that this distinction according to the pulse-rate, though it has some value, cannot be regarded by itself as final. The characters seen in the same case may vary at different periods of the illness.

[The term Undulant fever is now in general use.]

P. W. B.-S.

Erratum.

Bulletin No. 2 (Nov. 30, 1912), p. 75, line 14 from bottom, for "in a dilution of 1/10" read "in a dilution of 1/30."

HEAT STROKE.

Ogilvie (W. H.). **Sunstroke—A Heresy.**—*Jl. R. Army Med. Corps.* 1912. Oct. Vol. 19. No. 4. pp. 444-446.

The author suggests that there is no such thing as sunstroke: all cases of this kind are heatstroke. Heatstroke is generally due to non-radiation of the heat from the body, caused by insufficient evaporation from the skin, arising from an increase in the humidity of the air. He admits, however, that when evaporation and radiation from the skin barely suffice to maintain the body temperature below the dangerous point, exposure to the sun can precipitate heatstroke.

C. Birt.

Hiller (A.). **Die psychopathische Hitzschlagform und über sog. merkwürdige Fälle (Dritte Mitteilung).** [Heatstroke with Mental Symptoms. Third Communication.]—*Deut. Militärärzt Zeitschr.* 1912. Oct. 5. Vol. 41. No. 19. pp. 742-748.

9·5 per cent. of the 568 cases of heatstroke which occurred in the German Army between the years 1888 and 1900 were complicated with mental disorder. The psychic disturbance is probably of the same nature as the neurasthenic symptoms which sometimes follow accidents. The admissions for mental ailments, including neurasthenia and hysteria, in the German Army have gradually risen from 544 in 1896 to 1,839 in 1908. Should these mentally unstable soldiers suffer from heat stroke, psychic symptoms may be expected. There may be noted hallucinations, illusions, delusions of persecution, excitement, restlessness, and talkativeness. Suicidal tendencies are frequent. The prognosis is favourable.

It is necessary to make post mortem examinations on all supposed cases of heatstroke which end fatally, for in 8 out of 36 autopsies various chronicly diseased conditions of the organs were discovered.

C. B.

MISCELLANEOUS.

East Africa Protectorate. **Annual Report of the Medical Department for the Year 1911.**—49 pp. F'cap. 1912. London: H.M. Stationery Office.

In the mountainous zone, comprising the provinces of Ukamba and Naivasha, including the Uasin Gishu Plateau at an altitude varying up to 9,000 feet, the health of the European Officials was on the whole satisfactory. The greater proportion of cases of illness were due to malaria, the malignant tertian parasite being responsible; quartan infections were rarely found. In Fort Hall district during the wet season digestive and bronchial affections were frequent, and outbreaks of dysentery and diarrhœa occurred in some native villages, probably due to a state of semi-famine during a cold, wet, spell of weather. In Nyanza and Kenia malaria was specially prevalent. The disease is indigenous and frequent in both these provinces. In the latter the vast majority of fatalities occurred in men who had returned to their villages to die after having been employed on work at the coast. They had undoubtedly brought the infection with them and could not be seen early enough for the administration of quinine.

Trypanosomiasis.—The position of trypanosomiasis remains the same as noted in last year's Report. It is undoubtedly dying down into a state of quiescence and is strictly confined to the *Glossina palpalis* infected areas in Kavirondo. After ten years' observation no extension beyond its original limits has been noted.

Relapsing Fever.—The existence of endemic spirochaetosis in the Kenia Province has been established beyond doubt. A case was seen in a Kavirondo policeman.

Enteric Fever.—No cases were reported from the Kenia Province, but four cases occurred in Nyanza amongst the officers of the Marine Department.

Leprosy.—This disease occurred in both provinces.

Beriberi.—One case was noticed in a sailor of the Uganda Marine.

Plague.—Kisumu experienced its annual occurrence of plague. In the early part of the year it was noticed that an epidemic existed amongst the rats. On April 23rd the first human plague case was admitted to hospital. Altogether 64 cases occurred, with a mortality of 49, giving a death rate of 76·56 per cent. As in former years the disease originated in old Kisumu. Judged by the death rate it would appear as if the virulence of the disease was getting slightly less. Forty-five of the cases were of the bubonic type, and 19 pneumonic.

G. C. Low.

Gabbi (Umberto). **Tropical Diseases in Tripoli.**—*Jl. of Trop. Med. & Hyg.* 1913. March 1. Vol. 16. No. 5. pp. 68-69.

A list of tropical diseases met with by the author during a tour in Tripoli is given. Undulant fever, kala azar, relapsing fever,

malaria, and yaws were all seen, and in addition to these, skin diseases such as psoriasis tropica, ulcus tropicum, ulcus infantum, lichen tropicum, granuloma venereum, tinea alba, and tinea nigra circinata were frequent. Apparently the Arabs on the coast showed the same diseases as the inhabitants in the interior, and this is not to be wondered at because the races are similar and the climate almost the same.

G. C. L.

MAURITIUS. **Annual Report on the Medical and Health Department for 1911.** [DENMAN (R.), Director.]—10 pp. F'cap. 1912. Mauritius: Government Printing Office.

Malaria and Hypertrophy of the Spleen.—2,117 cases were treated in the hospitals with a death-rate of ·89 per cent. Splenic hypertrophy fell from 561 to 380, showing that malaria is on the decrease.

Dysentery.—566 cases with a mortality of 12·54 per cent. were reported, this showing a slight decrease in the number and death rate from the former year (1910).

Enteric Fever.—Fifty-three cases were treated in the various hospitals against 48 in 1910 and 77 in 1909. The death rate was 22·6 per cent. The total number of cases notified in the Colony, including the above, was 182 with a case-mortality of 18·1 per cent. The diagnosis in most, if not all, of these cases was verified by Widal's reaction.

Pneumonia.—1,186 deaths occurred from this disease alone. It was very prevalent among the estate coolies, especially towards the end of the year. As the disease took on a quasi-epidemic form, plague was suspected but careful examinations of the sputum showed an absence of plague bacilli and proved that the disease was ordinary pneumonia.

Beriberi.—Eleven cases with three deaths were treated during the year. Some cases of epidemic dropsy resembling beriberi were reported. These occurred in one family.

Leprosy.—156 people were treated for leprosy at the leprosy asylum St. Lazare. Of these 82 belonged to the general population and 74 were Indians. 36 were discharged and 25 died, leaving 95 in the asylum at the end of the year.

Plague.—124 cases were treated in the general hospitals and 36 in the lazarets, against 77 and 243 in 1910. The end of the 1910-11 outbreak was abrupt, 86 cases occurring in January 1911, 22 in February, 5 in March and 6 in April; the last case was declared on the 20th of that month. Two cases were reported in June and then one on the 27th August, but the 1911-12 outbreak was delayed really until the end of September, when isolated cases began to appear. Up to December 31st, only 51 more cases were reported, making the total for the twelve months 173; of these 131 died, giving a death rate of 75·7 per cent. A table shows the incidence and fatality of the disease in each year since its introduction in 1899.

Surra.—Fifty-one animals were reported to have died from surra during the year; the figures for the last four years are as follows:—

1907.	1908.	1909.	1910.	1911.
306	192	158	50	51

The reduction probably means that most of the susceptible animals are now immune to the disease.

G. C. L.

Moss (C. J. A.). **Disease in Madagascar.**—*Jl. of Trop. Med. & Hyg.* 1913. Jan. 15. Vol. 16. No. 2. pp. 17-23.

In this paper, in which are described the ordinary diseases present in Madagascar, the author states that in his experience elephantiasis is rare in the province of Imerina. He has frequently seen it attacking the vulva, less frequently the legs, and never the scrotum. On the east coast of the island it is described as fairly common. According to observations made at the French Hospital there is a very high incidence of filariasis amongst the general population. Of other tropical diseases malaria is endemic practically all over the island. Dysentery is common, especially on the coast, while other cosmopolitan maladies such as tubercle and syphilis are frequently met with. A brief synopsis of these is given.

Breinl (A.). **Report on Health and Disease in the Northern Territory.**—*Bull. of the Northern Territory.* 1912. July. No. 1. pp. 2-24.

The author states that an expedition to the Northern Territory of Australia in which he took part was, on account of the short time spent in the country, limited to a comparatively small area of this vast district, but the route enabled a large number of observations to be made.

The Northern Territory comprises about one-fifth of the Australian Continent. It supports at present a very scanty population, consisting of a small number of Europeans, of Chinese, of a few Japanese and other eastern races, and in addition of an aboriginal population, the number of which can only be roughly guessed and which has only been civilised to a very slight extent. The aborigines, roving hither and thither over hundreds of square miles, lead an apparently objectless existence. The Territory, therefore, offers peculiarities, especially from the medical point of view.

The question of the suitability of this part of Australia for a white population is a subject on which much may be written. In Breinl's opinion the subject covers such a vast field that it is necessary to approach it from a scientific standpoint. Careful and accurate physiological and pathological observations must be made over a series of years and to a less extent over a lifetime, to ascertain such effects on the white man's constitution as continuous action of the sun's rays, the effect of long continuous work out of

doors in the sun, the lack of a true winter season, the influence of the continuous high temperature upon the blood and blood forming organs and the internal metabolism in general.

As regards tropical diseases, many of these exist in the Northern Territory.

Malaria. This disease is very prevalent, appearing in more or less severe epidemics, in certain years causing much debility and a heavy mortality. It is common amongst the blacks who have come in contact with, and have been employed by the whites. Most of the cases amongst the aborigines are of the same type as those occurring on the stations or at the settlements to which they belong. An anopheline, *Nyssorhynchus annulipes*, is in all probability the agent which distributes the parasites from one person to another. Numerous larvae and pupae were collected from water-holes and the adult insects were bred out and identified. KINOSHITA in Formosa has shown that this species can transmit the disease.

Ankylostomiasis. Infections with ankylostomes have only been observed in a few cases, three in 1908 and one in 1910. It was not possible to determine whether the infection was contracted locally or whether it was brought from other regions of the Commonwealth.

Filariasis. A few cases of this condition have been noticed.

Beriberi. Patients affected with beriberi have been seen now and again in small numbers; they are chiefly found among the crews of pearling boats.

Trachoma. Trachoma, which is so prevalent in Western Queensland and Western Australia, has also been seen in the Northern Territory.

Amongst the aborigines syphilis, ulcerative granuloma, yaws, and leprosy are met with. Yaws is reported as being especially prevalent amongst the children. In addition to these, diseases of unknown origin occur.

Breinl points out that it is necessary to keep in mind that the Northern Territory, as far as the introduction of new diseases is concerned, is the most vulnerable point of tropical Australia. It is only a short distance from the Dutch East Indies and from China, where diseases are prevalent which if once introduced might give rise to serious epidemics. In the event of a white population being imported there is little doubt that malaria will spread further and form a serious menace to the economic welfare of the country. Preventive measures, Breinl believes, should be adopted and carried out now in a thorough and scientific manner; if they are delayed until an increased population appears, the difficulty of eradicating the disease must necessarily be greatly increased.

The conclusions reached are as follows:—

Malarial fever, both the simple tertian and subtertian, is fairly widespread, the latter type being in all probability introduced from New Guinea by means of insufficiently treated parasite carriers. A species of mosquito, *Nyssorhynchus annulipes*, was found in nearly every locality visited and in all probability acts as the intermediary host of the malarial parasite in those regions. Measures and means to prevent the further spread of malaria must be taken in the near future; otherwise it may prove a serious menace for the successful populating of the area.

On the whole, the white population shows, at present, a comparative freedom from disease, if malaria be excepted. The reason for the slow and tardy increase of the population of the territory is not due to the prevalence of disease, but must be sought in other directions.

The aborigines on the whole seem to enjoy fairly good health, but more disease, as far as one can rely on information, prevails amongst the coastal tribes than amongst those living away from the coast. The diseases amongst these primitive inhabitants, some of which are of unknown origin and not studied up to the present date, require further elucidation as regards their etiology, spread, and epidemiological importance from the point of view of the settlement of the Territory.

G. C. L.

WHITMORE (A.). **On the Bacteriology of an Infective Disease Occurring in Rangoon.**—*British Med. Jl.* 1912. Nov. 9. No. 2706. pp. 1306-1308.

A description of a disease resembling glanders is given. The symptoms were those of a septicaemia with gross lesions in many organs. The lungs were specially affected and the lesions there were like those commonly present in acute glanders. Culturally, however, the *Bacillus mallei* was absent, but a bacillus, about the size and shape of that organism, occurred in very large numbers in all the acute lesions. The cultural characteristics of the new germ are given as follows:—

1. Rapid and luxuriant growth upon ordinary peptone agar.
2. Wrinkling which occurs early in the growth upon glycerine agar.
3. Pellicle formation at the surface of broth cultures.
4. The appearances of gelatine stab cultures at the end of the third day, and after one week's growth.
5. The curious tangled masses of long filamentous bacilli found in cultures upon salted agar.
6. The active serpentine motility of the bacilli in young cultures, and its early disappearance as the cultures age.

EYRE, who examined cultures brought to London, stated that the lesions produced by the Rangoon bacillus were so like those produced by glanders, that, in showing the characteristics of Strauss's reaction in the guinea-pig, he found that it was immaterial whether he selected a guinea-pig infected with true glanders or one inoculated with the Rangoon bacillus.

G. C. L.

Book Reviews.

Blackham (R. J.). **Aids to Tropical Hygiene.**—F'cap. 8vo. viii. + 192 pp. 1912. London: Baillière, Tindall & Cox. [Cloth 3*s*. net. Paper cover 2*s*. 6*d*. net.]

A useful little handbook containing chapters on the following:—Climate and Meteorology; Air and Ventilation; Water and Water-Supplies; Food and Feeding; Clothing; Sites, Soils, and Houses; Disposal of Refuse; Disposal of the Dead; Insects and Disease; Animal Parasites; Prevention of Malaria; Disinfectants and Disinfection. In addition there are two appendices, the first dealing with tropical diseases and measures for their prevention, the second giving the distinctive characters of the more important species of flies found in houses.

G. C. Low.

Harston (G. Montagu). **The Care and Treatment of European Children in the Tropics.** Introduction by Sir Patrick Manson. —Crown 8vo. xvi. + 232 pp. With 14 plain and 3 coloured plates. 1912. London: Baillière, Tindall & Co. [7*s*. 6*d*. net.]

The care of European children in the tropics is quite as difficult as, if not more so than that of their parents. The subject has received little attention, at least in books, up to the present time and there is certainly an opening for Dr. Harston's little work. It is very clearly written, the matter is good, and the details are treated in a practical and convincing manner. It is evident that the author has studied this branch of tropical medicine closely and his experience should be specially valuable to those who may be called upon to attend children in Hong Kong or other colonies. The work furnishes most interesting reading and can be thoroughly recommended to all.

G. C. L.

Clemesha (Wm. Wesley). **The Bacteriology of Surface Waters in the Tropics.**—Demy 8vo. vii. + 161 pp. 1912. Calcutta: Thacker, Spink & Co.; London: E. & F. N. Spon, Limited. [7*s*. 6*d*. net. or 7 rs. 8 an.]

This subject is one of the greatest importance for the tropics, the conditions of which differ so much from those existing in colder climates such as England. The work is divided into twelve chapters with three appendices. After an introduction the bacteriology of the faeces of man and other animals is discussed, then the prevalence and significance of streptococci in waters, the prevalence and significance of a class of organisms which ferments glucose but not lactose in surface waters, the action of direct sunlight on the common faecal organisms, the effect of sunlight on large natural lakes, the results of analysis of the waters of lakes and rivers in India, the position of certain faecal organisms

in nature, the application of the foregoing researches to water analysis, and lastly, the "coli" method is compared with the separate species method.

A large portion of the work was done at the King Institute of Madras; it was afterwards continued in the author's laboratory in Bengal for a period of about four years. The author draws attention to the help he has had from his assistants AIYAR and MUDALIYAR, the latter being responsible for many of the results reported in the book.

All workers in India and, for that matter, in the tropics generally must be thankful to Major Clemesha for his very valuable work, containing as it does so much interesting research and useful information. It should become a textbook for public health workers in India and in other tropical colonies.

G. C. L.

LANGERON (M.). **Précis de Microscopie. Technique—Expérimentation—Diagnostic.** Preface by Professor R. BLANCHARD.—Collection de Précis Médicaux. 8vo. xxiii. + 751 pp. With 270 text-figures. 1913. Paris: Masson et Cie. [10 fr.]

The work is divided into three parts. Part 1 deals with the microscope and its accessories, pages 1-227; part 2 with general methods, pages 231-463; part 3 with special methods, this again being subdivided into three sections—protozoa, metazoa and botanical technique, pages 467-721. Finally, there is a general bibliography with an index, the total length of the book with the latter reaching 751 pages. The subject is treated in great detail and everything that is required to be known about microscopes, stains, fixing agents, hardening methods, the cutting of sections, preserving fluids for museum specimens,—staining of amoebae, spirochaetes, sporozoa, infusoria, worms, and arthropods,—cytological technique, micro-chemistry and medico-legal microscopic technique will be found within its pages. The author is specially qualified to write such a work as he has acted as the *préparateur* to the *Faculté de Médecine de Paris* for ten years and is also "*Chef des Travaux*" of the *Institut de Médecine Coloniale.*

The book should prove indispensable for laboratories, whether of histology, zoology, botany or parasitology, and will save workers much time and labour in looking up details, which are often widely scattered throughout the literature. There are 270 figures in the text. The price is moderate and should therefore be well within the reach of all.

G. C. L.

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[Continued from Bulletin No. 6, pp. 321-355.]

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CONTENTS.

PLAGUE.

Page.

SEVENTH REPORT ON PLAGUE INVESTIGATIONS IN INDIA. (ROWLAND, BROOKS, MACCONKEY and others) 537–547

SIGNORELLI & CALDAROLA: Agglutination Experiments 547

GUITERAS; VAZQUEZ; AGRAMONTE; CAPOTE: Plague in Havana 548

DEMINSKY: Plague in Astrakhan 549

BROWNE: A Case of Plague at Shotley 549

GUTHRIE; WILSON: The Diagnosis of Plague 550

MARTIN: Transmission by Fleas 550

D'HOSTALRICH: Treatment by Yersin's Serum 552

BECK; HEISER: Prophylaxis 553

CREEL; RUCKER: Rats and Plague 554

MARKL: Bacteriological Diagnosis of Rat Plague ... 555

ANDERSON & MCLAUGHLIN: A Plague-like Organism from a Rat 556

The Extension of Plague in 1912 557

LEPROSY.

NOC: Mosquitoes and the Spread of Leprosy 558

LEBOEUF: The House Fly and the Spread of Leprosy ... 558

SKELTON & PARHAM: The Bed Bug and the Spread of Leprosy 559

SOREL: Lepra Bacilli in the Glands of contacts 559

SUGAI & MONOBE: The Hereditary Transmission of Leprosy 559

BAYON: An Intradermal Reaction 560

PALDROCK: A Method of Demonstrating Lepra Bacilli in the Skin 560

JOYEUX: Leprosy in Upper Guinea 560

PARAVICINI: Leprosy in the Ivory Coast 561

de BEURMANN & LABOURDETTE: Leprosy in Indo-China 561

" " , RAMOND & LARROQUE: A Case of Leprosy and Acromegaly 561

PALDROCK: Treatment of Leprosy by Salvarsan... ... 562

MINETT: Treatment by Nastin and Benzoyl Chloride ... 563

SCHUMACHER: Treatment by Nastin 563

RUTHERFOORD: " by Leproline 564

PAPELLIER: " by Baths in Japan 564

LEBOEUF: The Curability of Leprosy 565

RABINOWITSCH: Lepra Bacilli in the Blood 565

SUGAI & MONOBE: " " " Milk 566

LAGANE: " " " Urine 566

MERIAN: " " " Faeces 567

STANZIALE: Inoculation of Rabbits 567

KRITSCHEWSKY & BIERGER; SMITH & RIVAS; CURRIE, CLEGG & HOLLMANN: Organisms Cultivated from Leprous Lesions 568–570

LEPROSY—*continued.*

Page.
BAYON : A New Medium for the Cultivation of Leprosy 571
MACHOW : Kedrowski's Lepra Bacillus 571
KRAUS, HOFER & ISHIWARA : Lepra Bacilli and Bacteriolysis 571
ISHIWARA ; MARCHOUX & SOREL : Rat Leprosy ... 572
SUGAI & MONOBE : The Placenta and Leprosy 573
SUGAI : Visceral Leprosy 573
PRINGAULT : The Blood and Leprosy 573
PALDROCK : Fish and Leprosy 573
BARBÉZIEUX ; ROUX : Prophylaxis 574
SUDHOFF ; ZAMBACO : Leprosy in Old Times ... 574–575

UNDULANT FEVER.

CARRIEU & ANGLADA ; VALLET & RIMBAUD ; RONCHÈSE : The Agglutination Reaction 576–577
BASSETT-SMITH : Diagnosis and Treatment 578
SCORDO : Experimental Treatment of Goats 578
BASSETT-SMITH : Para-melitensis Fever 579
LONGO : Undulant Fever in Infants 580
SUAREZ DE FIGUEROA : Undulant Fever in Spain ... 581
Erratum... 582

HEAT STROKE.

OGILVIE : Heat Stroke and Sunstroke 583
HILLER : Heat Stroke with Mental Symptoms 583

MISCELLANEOUS.

EAST AFRICA PROTECTORATE : Annual Report... ... 584
GABBI : Tropical Diseases in Tripoli 584
MAURITIUS : Annual Report 585
MOSS : Disease in Madagascar 586
BREINL : Health and Disease in the Northern Territory 586
WHITMORE : An Infective Disease in Rangoon 588

BOOK REVIEWS 589–590

LIST OF REFERENCES.

Amoebiasis (including Amoebic Dysentery and Liver Abscess) ; Beriberi ; Blackwater Fever ; Cholera ; Dengue ; Dysentery (Bacillary and Unclassed) ; Filariasis ; Heat Stroke ; Helminthiasis ; Kala Azar (and Tropical Sore) ; Leprosy ; Malaria ; Myiasis ; Pappataci Fever ; Pellagra ; Plague ; Relapsing Fever (and Spirochaetosis) ; Skin Diseases ; Sleeping Sickness (and other Trypanosomiases) ; Typhus Fever ; Undulant Fever ; Yaws ; Yellow Fever ; Miscellaneous (Gangosa, Porocephaliasis, Rat-bite, Snake-bite, Sprue, Verruga Peruana)—Unclassed—Biting Arthropods and Ticks—Protozoology 591–618